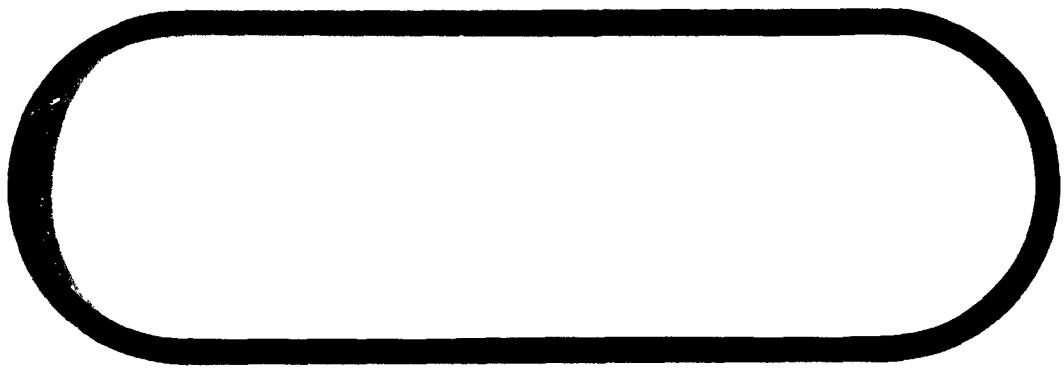
63-3-6

406228

BOEING



406 228

SEATTLE, WASHINGTON

CODE IDENT NO. 81205

NUMBER T2-2564, Vol. 3

TITLE Engineering Development Laboratory (EDL) Test Reports, Launch and Communications Control Console (U)

MODEL NO. WS-133A CONTRACT NO. AF 04(647)-289

ISSUE NO. 50 ISSUED TO A.S.T.I.A.

SPECIAL LIMITATIONS ON ASTIA DISTRIBUTION

ASTIA may distribute this report to requesting agencies subject to their security agreement, approved fields of interest, and the following:

[X] UNLIMITED—To all agencies of the Department of Defense and their contractors.

[ ] LIMITED—To U. S. Military organizations only.

This report may be distributed to nonmilitary agencies not approved above subject to Boeing approval of each request.

NOTE: the LIMITED category may be checked only because of actual or potential patent, proprietary, ethical, or similar implications.

PREPARED BY	D. Gladish	11/30/62
SUPERVISED BY	E. G. Rolling	1/31/63
APPROVED BY	R. B. Edgar	2-1-63
APPROVED BY		
CLASS & DISTR APPROVED BY	R. B. Edgar	2-5-63 (DATE)

REV SYM A

VOL. NO. 3	OF T2-2564
SECT. 1	PAGE 1

US 4287 9035 ORIG. 8/62

2-8142-2

ACTIVE PAGE RECORD

SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES					
			PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM
1	1	A						
	2	A	3	A	4	A		
2	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
3	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	8a							
	8b							
	9							
	9a							
	10							
	10a							
	10b							
	11							
	11a							
	12	A	12a	A				
	13	A	13a	A	13b	A	13c	A
	14	A	14a	A				
	15							
	15a							
	15b							
	15c							
	15d							
	15e							
	15f							
	15g							
	15h							
	15i							
	15j							
	15k							

SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES					
			PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM
3	16							
	16a							
	16b							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24	A	24a	A	24b	A	24c	A
	25	A	25a	A	25b	A		
	26	A	26a	A	26b	A		
	27	A	27a	A	27b	A	27c	A
			27d	A	27e	A	27f	A
	28	A	28a	A	28b	A		
	29	A	29a	A				
	30	A	30a	A				
	31	A	31a	A	31b	A	31c	A
			31d	A	31e	A		
	32							
	32a							
	32b							
	32c							
	32d							
	32e							
	32f							
	32g							
	32h							
	33							
	33a							
	33b							
	34							
	34a							
	34b							
	35							
	35a							
	35b							
	36							
	36a							
	36b							
	37	A	37a	A	37b	A	37c	A
			37d	A	37e	A		
	38	A	38a	A				
	39	A	39a	A	39b	A		
	40	A	40a	A				

SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM	SECTION	ORIG REL PAGE NO.	REV SYM	ADDED PAGES PAGE NO.	REV SYM	PAGE NO.	REV SYM	PAGE NO.	REV SYM
4	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																
	11																
	12																
	13																
	14																
	15																
	16																
	17																
	18																
	19																
	20																
	21																
	22																
	23																

SYM	DESCRIPTION	DATE	APPROVED
A	Section 1 Added Page 3 & 4 Revised Page 2 Section 2 Added Pages 12a, 13a, 13b, 13c, 14a, 24a, 24b, 24c, 25a, 25b, 26a, 26b, 27a, 27b, 27c, 27d, 27e, 27f, 28a, 28b, 29a, 30a, 31a, 31b, 31c, 31d, 31e, 37a, 37b, 37c, 37d, 37e, 38a, 39a, 39b, 40a. Revised Pages 12, 13, 14, 24, 25, 26, 27, 28, 29, 30, 31, 37, 38, 39, 40.	11-27-62	W.W.L.

THE BOEING COMPANY

NUMBER T2-2564, Vol. 3 MODEL NO. WS-133A

TITLE Engineering Development Laboratory Test Reports,
Launch and Communications Control Consoles

PREPARED BY	R. W. Brill	
SUPERVISED BY		8/15/62
APPROVED BY	E. G. Rolling	8/25
RELIABILITY APPROVAL	A. L. Bohn	(DATE)

AF 04(647)-289
CONTRACT NO.

5-78105-5640-66619
CHARGE NUMBER

VOL. 3 NO. T2-2564
SEC. 2 PAGE 1 OF 11

2-5142

SECTION TITLE PAGE U3 428 0000 REV. 2/61

REFERENCES

D2-5684 Vol. 3	Engineering Development Laboratory -- Console, Launch Control (LCC); Console, Communications Control (CCC).
MIL-STD-130A	Identification and Marking
MIL-STD-803	Human Engineering Criteria
D2-5450	Model Specification, Console, Launch Control
D2-5452	Acceptance Functional Test Requirements for Launch Control Console
D2-6913	Acceptance Functional Test Procedures, Console, Launch Control
D2-10778	Model Specification, Console, Communications Control
D2-11337	Acceptance Functional Test Procedures, Console, Communications Control

FIGURE INDEX

TABLE OF CONTENTS

1.0 PURPOSE

1.1 The Test Reports contained within correspond to the Test Requirements specified in D2-5684, Vol. 3, for the EDL/PT of the Launch and Communications Control Consoles. The Test Requirements included tests to show specification compliance, compatibility under marginal test conditions, and interface problems for the Launch and Communications Control Consoles of the WS-133A Weapon System.

1.2 SCOPE

1.2.1 The test reports contained within this volume cover the following Figure A equipment:

Figure A	Nomenclature
1243	Launch Control Console
1338	Communications Control Console

1.2.2 The component parts of the consoles included are:

1. Pedestal structure.
2. Top section.
3. Launch Control Console pedestal.
4. Audible alarm.
5. Display module.
6. Alarm and monitor.
7. Program Control Panel.
8. Launch Control Panel.
9. DC Filter.
10. Alarm driver.

2.0 TEST REPORT MATRIX

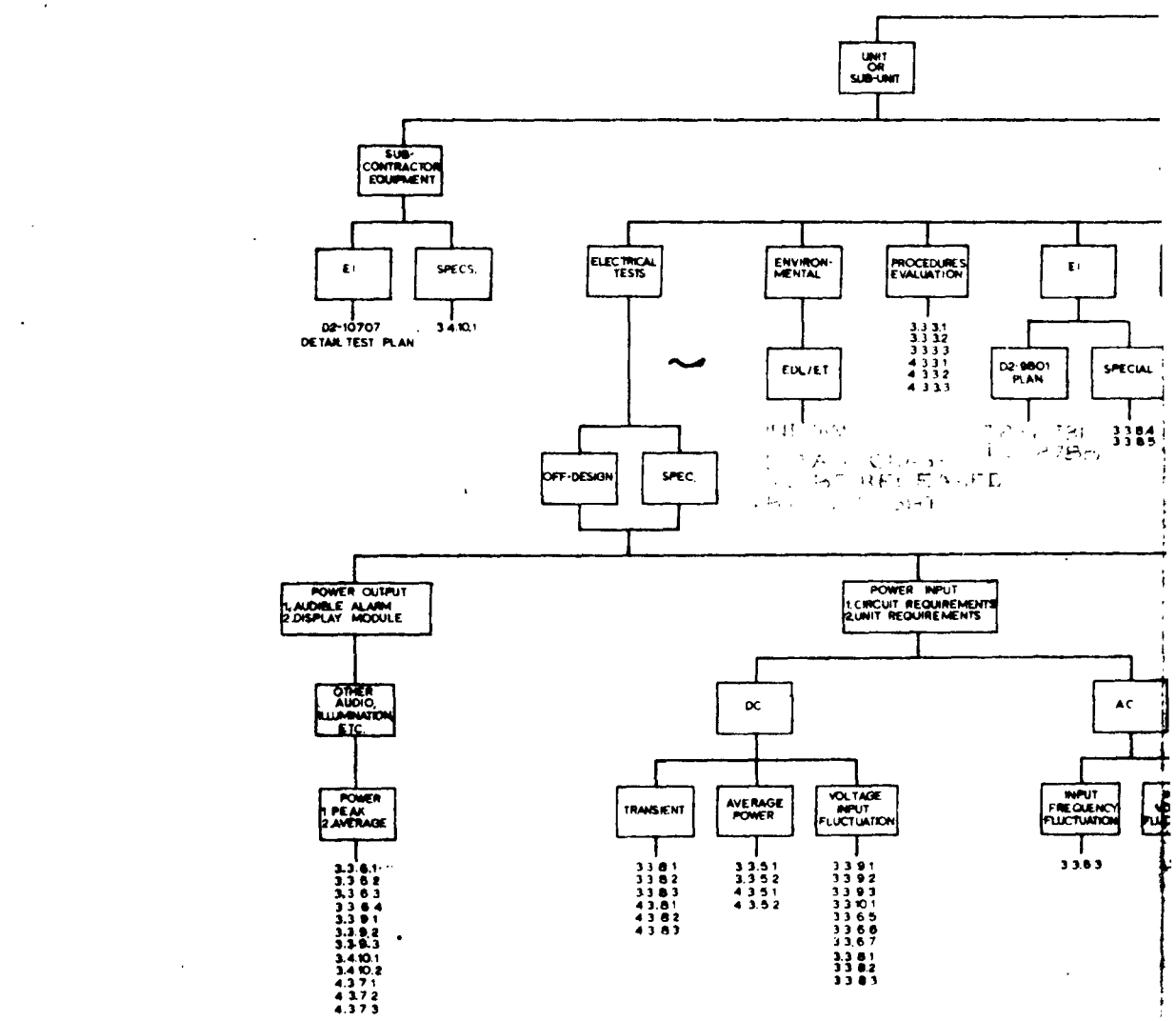
2.1 Figure 2.3-1 is the matrix which portrays the EDL/ET reports for the Launch and Communications Control Consoles. This matrix provides a method for rapidly identifying the test report which applies to a specific category of tests. The EDL Test Reports which are within the scope of this document are :

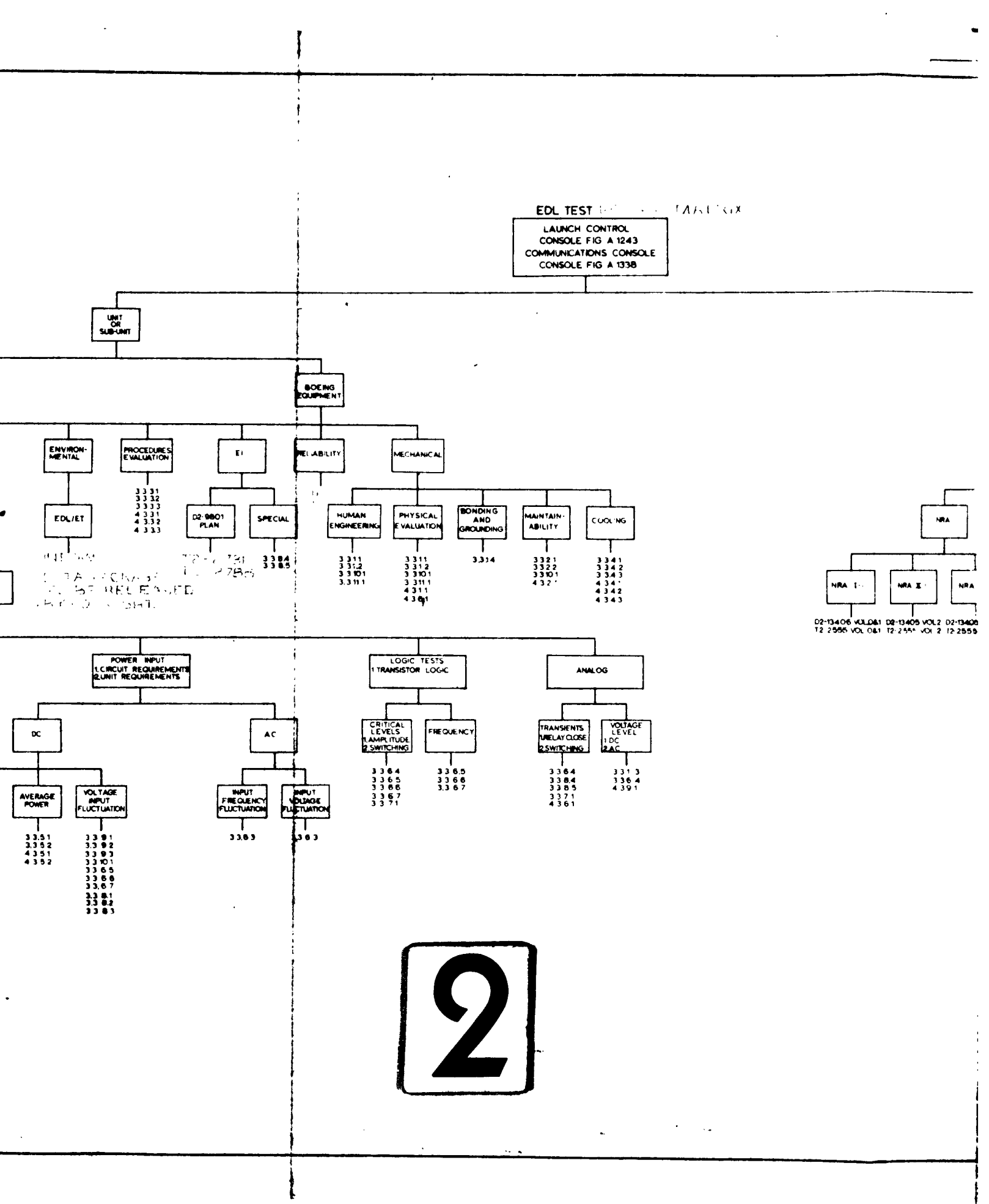
1. Network Resolution Area (NRA).
2. Engineering Development Integration Test (EDIT)
3. Electronic Interference Tests (EI).
4. Qualification Environmental Testing (ET).
5. Performance Testing (PT).

2.1.1 The Test Reports for programs 1 thru 4 are contained within the documents shown in the Test Report Matrix (Fig. 2.3-1). These documents, together with this volume, comprise the EDL Test Reports for the Launch and Communications Control Consoles.

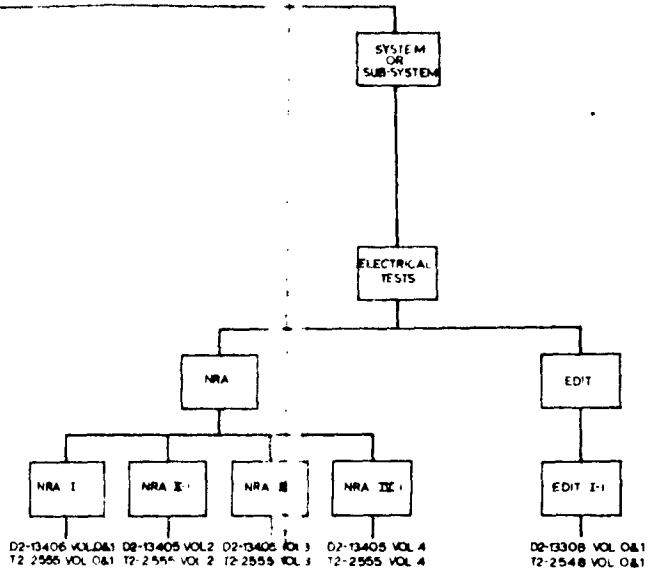
2.1.2 The Test Report Matrix shows the areas covered by the EDL test program on sub-unit equipment, and system levels. The test objective blocks for the general categories of Power Input, Power Output, etc., are the types of sub-units upon which tests were performed.

2.1.3 Test Reports for tests performed, other than electrical, are well defined by the test objective titles on the Test Matrix.


UNIT OR SUB-UNIT
SUB-CONTRACTOR EQUIPMENT
E!
SPECS.
D2-10707 DETAIL TEST PLAN
3.4.10.1
ELECTRICAL TESTS
ENVIRON-MENTAL
PROCEDURES EVALUATION
E!
EDL/ET
3.3.3.1
3.3.3.2
3.3.3.3
4.3.3.1
4.3.3.2
4.3.3.3
D2-9801 PLAN
SPECIAL
3.3.8.4
3.3.8.5
OFF-DESIGN
SPEC.
POWER OUTPUT 1. AUDIBLE ALARM 2. DISPLAY MODULE
POWER INPUT 1. CIRCUIT REQUIREMENTS 2. UNIT REQUIREMENTS
OTHER AUDIO, ILLUMINATION, ETC.
DC
AC
POWER 1. PEAK 2. AVERAGE
TRANSIENT
AVERAGE POWER
VOLTAGE INPUT FLUCTUATION
INPUT FREQUENCY FLUCTUATION
3.3.6.1
3.3.6.2
3.3.6.3
3.3.6.4
3.3.9.1
3.3.9.2
3.3.9.3
3.4.10.1
3.4.10.2
4.3.7.1
4.3.7.2
4.3.7.3
3.3.8.1
3.3.8.2
3.3.8.3
4.3.8.1
4.3.8.2
4.3.8.3
3.3.5.1
3.3.5.2
4.3.5.1
4.3.5.2
3.3.9.1
3.3.9.2
3.3.9.3
3.3.10.1
3.3.6.5
3.3.6.6
3.3.6.7
3.3.8.1
3.3.8.2
3.3.8.3
3.3.6.3


EDL TEST
LAUNCH CONTROL CONSOLE FIG A 1243
COMMUNICATIONS CONSOLE CONSOLE FIG A 1338
UNIT OR SUB-UNIT
BOEING EQUIPMENT
ENVIRON-MENTAL
EDL/ET
PROCEDURES EVALUATION
3331
3332
3333
4331
4332
4333
EI
D2-9801 PLAN
SPECIAL
3384
3385
RELIABILITY
MECHANICAL
HUMAN ENGINEERING
3311
3312
3.3101
3.3111
PHYSICAL EVALUATION
3311
3312
3.3101
3311
4311
4361
BONDING AND GROUNDING
3.3.14
MAINTAIN-ABILITY
3321
3322
3.3101
4.3.2
COOLING
3341
3342
3343
4.3.4
4342
4343
NRA
NRA I
NRA II
D2-13406 VOL 0&1 T2-2555 VOL 0&1
D2-13405 VOL 2 T2-2555 VOL 2
D2-13406 T2-2555
POWER INPUT
1 CIRCUIT REQUIREMENTS
2 UNIT REQUIREMENTS
DC
AVERAGE POWER
3.3.5.1
3.3.5.2
4.3.5.1
4.3.5.2
VOLTAGE INPUT FLUCTUATION
3.3.9.1
3.3.9.2
3.3.9.3
3.3.10.1
3.3.6.5
3.3.6.6
3.3.6.7
3.3.8.1
3.3.8.2
3.3.8.3
AC
INPUT FREQUENCY FLUCTUATION
3.3.8.3
INPUT VOLTAGE FLUCTUATION
3.3.6.3
LOGIC TESTS
1 TRANSISTOR LOGIC
CRITICAL LEVELS
1. AMPLITUDE
2. SWITCHING
3.3.6.4
3.3.6.5
3.3.6.6
3.3.6.7
3.3.7.1
FREQUENCY
3.3.6.5
3.3.6.6
3.3.6.7
ANALOG
TRANSIENTS (RELAY CLOSE)
2. SWITCHING
3.3.6.4
3.3.8.4
3.3.8.5
3.3.7.1
4.3.6.1
VOLTAGE LEVEL
1. DC
2. AC
3.3.1.3
3.3.6.4
4.3.9.1

2



3

▷ UNDETERMINED

FIGURE 2.3-1

2.1.4 The placement of the electrical requirements found in the EDL Console, Launch Control (LCC), Console, Communication Control (CCC) document, D2-5604, Volume 3.

2.1.4.1 The complete Test Requirement in D2-5604 specified the input function(s) and/or variable(s), including limit operation, which were to be applied and the resulting output(s) which were to be determined. The Test Reports incorporate the results of these tests.

2.2 Numbering of the Test Reports is identical to the associated Test Requirement.

2.2.1 Numbering is determined in the following manner:

1. The first number indicates section.
2. The second number indicates volume.
3. The third number indicates major area of test.
4. The fourth indicates the test.

2.2.1.1 For example, number 3.3.5.2 indicates:

1. 3. - Section 3.
2. 3. - Volume 3
3. 5. - Area of Test.
4. 2. - Test Number

2.3 Manufacturing and Inspection Record (MMIR) Test Logs are included with the equipment Serial Numbers listed with each Test Report. The logs are found with the equipment tested.

THE BOEING COMPANY

NUMBER T2-2564, Vol. 3 MODEL NO. MS-133A

TITLE Engineering Development Laboratory Test Reports,
Launch Control Console.

PREPARED BY	T. G. McCarthy	7/18/62
SUPERVISED BY		7/18/62
APPROVED BY	P. K. Hagiwara	7-18-62
RELIABILITY APPROVAL		(DATE)

AF 04(647)-189
CONTRACT NO.

5-78105-5640-60619
CHARGE NUMBER

3

SUMMARY

TO BE ADDED UPON COMPLETION OF TESTING.

This page will be a summary of the test results obtained during the EDL/PT program. It will be the integrated results of all tests conducted during the program. The results will include meeting of design objectives, specifications, recommendations, etc.

TEST REPORT 3.3.1.1A

TITLE

Physical Examination of the Launch Control Console, 25-24172-7

OBJECTIVE

To inspect the Launch Control Console for physical appearances, conformance to engineering drawing and human engineering requirements.

CONCLUSIONS

The test objective was realized

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, S/N: 0002 (Pre EC-1)

TEST DESCRIPTION

The components and subsystems of the Launch Control Console

a.	Pedestal Structure Assembly	25-24192-11
b.	Top Section Assembly	25-24173-17
c.	LCC Pedestal Assembly	25-24174-9
d.	Missile Status Launcher Indicator	25-24175-4
e,	Alarm and Monitor Panel	25-24176-11
f.	Program Control Panel	25-24177-7
g.	Launch Control Panel	25-24178-16
h.	D. C. Power Filter	25-24179-9
i.	Alarm Control	25-24180-9
j.	Audible Alarm Assembly	25-24181-9

The components and subsystems of the Launch Control Console were examined for:

1. General Appearance and quality of workmanship
2. Conformance to MIL STD - 130 A
3. Conformance to MIL STD - 803
   Conformance to D2-5450
5. Conformance to applicable assembly drawings
6. Dimensions per drawings

SUMMARY OF TEST RESULTS

a. Program Control Panel (25-24177)
   Program Function Control Knob, when released, does not always leave the "Calibrate" position as required.

SUMMARY OF TEST RESULTS (Continued)

b. Alarm and Monitor Panel (25-24176)
Power resistor attached to terminals E_2 and E_4 is discoloring epoxy and turning mounting card brown.

c. Alarm Control (25-24180)

1. Card A1 - heat sink for Q_1, Q_2, R_2 and R_{10} are filled with epoxy.
2. Card A2 - heat sink for Q_1, Q_2, R_2, R_{10} and R_{13} are filled with epoxy.

d. All other LCC Components were acceptable

e. Simplification or Improvement of Design

1. The intended use of the handle of the Missile Status Indicator Launcher (25-24175) is to break the plug-in connector for panel removal; however, it is being used for removing, installing and carrying purposes as well. For these operations, the handle gives the operator little control. Two rigid handles (top and bottom placement) could possibly insure greater control.

2. In order to disconnect the DC Filter Assembly (25-24179), the Alarm and Monitor Panel must be removed first. The operational design (BC-1) has cable length long enough to remove the DC filter assembly, thus eliminating this problem.

3. The hand set bracket has a foam rubber pad on the Alarm and Monitor Panel (25-24176). This pad is deteriorating from continuous use. The operational design (BC-1) changed the handset bracket to stag horn type, thus eliminating this problem.

GENERAL INFORMATION

Test Engineer T. G. McCarthy Org. 2-6524-4
Charge to EWA Number 3007
Date Test Started 1-22-62
Date Test Completed 2-05-62
Location 9-120 Bldg. Bay E9 DC

TEST REPORT 3.3.1.1 B

TITLE

Physical Examination of the Launch Control Console, 25-24172-11

OBJECTIVE

To inspect the Launch Control Console for physical appearances, conformance to engineering drawings and human engineering requirements.

CONCLUSIONS

The test objective was realized

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, S/N 0000001

TEST DESCRIPTION

The components and subsystems of the LCC

a.	Pedestal Structure Assembly	25-24192-22
b.	Top Section Assembly	25-24173-32
c.	LCC Pedestal Assembly	25-24174-18
d.	Missile Status Launcher Indicator	25-24175-6
e.	Alarm and Monitor Panel	25-24176-15
f.	Program Control Panel	25-24177-10
g.	Launch Control Panel	25-24178-18
h.	D.C. Power Filter	25-24179-14
i.	Alarm Control	25-24180-13
j.	Audible Alarm Assembly	25-24181-15

The components and subsystems of the Launch Control Console were examined for:

1. General appearances and quality of workmanship
2. Conformance to MIL STD - 130A
3. Conformance to MIL STD - 803
4. Conformance to D2-5450
5. Conformance to applicable assembly drawings
6. Dimensions per drawings.

SUMMARY OF TEST RESULTS

a. Connector Frame (25-25575-5) was not manufactured per engineering drawing.

b. Terminal Board (300A1TB-6) did not contain the bus bars necessary to establish continuity for status indicators LF 2, through 7.

c. All other LCC components were found to be acceptable in all areas.

d. Simplification or Improvement of Design.

1. The intended use of the handle of The Missile Status Indicator Launcher (25-24175) is to break the plug-in connector for panel removal. However, it is being used for removing, installing and carrying purposes as well. For these operations, the handle gives the operator little control. Two rigid handles (top and bottom placement) could possibly insure greater control.

GENERAL INFORMATION

Test Engineer T. G. McCarthy Org. 2-6524-4

Charge to EWA Number 3007
Date Test Started 3-27-62
Date Test Completed 4-29-62
Location 9.120 Bldg, Bay E9, DG

TEST REPORT 3.3.1.2

TITLE

Physical Examination of the Telephone Transmitter Control, C-3937/GTC

OBJECTIVE

To inspect the Telephone Transmitter Control for physical appearance, conformance to Engineering drawings and human engineering requirements.

CONCLUSIONS

The test objective was realized

ITEMS IN TEST

Telephone Transmitter Control, Part of Figure "A" 1243, Launch Control Console, 1274013-503, Serial No. 0000008
Scale, 12 units, 1/100th inch intervals

TEST DESCRIPTION

The Telephone Transmitter Control was examined for:

a. General Appearance and quality of workmanship

b. Conformance to RCA Drawing 1274013

c. Conformance to MIL-STD-130A

d. Conformance to MIL-STD-803

e. Conformance to D2-5450

f. Dimensions per drawing

SUMMARY OF TEST RESULTS

The Telephone Transmitter Control was found physically acceptable.

GENERAL INFORMATION

Test Engineers	M. E. Novak	Organization	2-6524-4
	T. G. McCarthy		2-6524-4
Charge to EWA No.	3007		
Date Test Started	6-28-62		
Date Test Completed	7-05-62		
Location	Bldg. 9-120, Bay E-9, Plant DC		

TEST REPORT 3.3.1.3

TITLE

Launch Control Console Insulation Test

OBJECTIVE

To determine the insulation resistance of the circuits of the Launch Control Console.

CONCLUSIONS

a. The Test objective was realized
b. The insulation resistance of the circuits met the design requirements of the Launch Control Console Model Specification, D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0000001, 25-24172-11
Megohmmeter - General Radio 1862B

TEST DESCRIPTION

The insulation resistance of all circuits not containing solid state devices was measured between circuit conductors and between circuits and console structure using a 50 volt test voltage.

SUMMARY OF TEST RESULTS

a. All resistances were greater than the minimum of 1 megohm required by Launch Control Console Model Specification D2-5450.

b. The test points used and the corresponding resistances obtained are listed in Figure 3.3.1.3-1.

GENERAL INFORMATION

Test Engineers M. E. Novak Organization 2-6524-4
T. G. McCarthy 2-6524-4

Charge to EWA Number 3007

Date Test Started 6-28-62

Date Test Completed 7-05-62

Location Bldg. 9.120, Bay E-9, Plant DC

TEST REPORT 3.3.1.3 (continued)

Plug No.	No. of pins measured	Results
300A1J19	63	All pins read greater than 20 megohms to structure
300A1J20	63	
300A1J21	63	
300A2TB6	6	All pins read greater than 20 megohms to structure
300A1TB3	6	All pins read greater than 20 megohms to structure
300A2TB4	6	All pins read greater than 20 megohms to structure
300A1TB2	6	All pins read greater than 20 megohms to structure except 1 and 2 which are grounded to structure per drawing.
300A1TB1	16	All pins read greater than 20 megohms to structure except 10 and 11 which are grounded to structure per drawing.
300A1P1	26	
300A1P3	10	
300A1P4	10	All pins read greater than 20 megohms to structure
300A1P8	26	
300A2P1	10	
300A2P2	10	
300A1P5	16	All pins read greater than 20 megohms except Pin "R" which is grounded to structure per drawing
300A1P2	11	All pins read greater than 20 megohms except Pin "C" which is grounded to structure per drawing.
300A1P6	5	All pins read greater than 20 megohms except Pin "D" which is grounded to structure per drawing.
300A1P9	5	All pins read greater than 20 megohms except Pin "D" which is grounded to structure per drawing.
300A1J6	10	
300A1J7	68	All pins read greater than 20 megohms to structure
300A1J9	9	
300A1J8	5	All pins read 20 megohms except Pin No. 1 which is grounded to structure per drawing.

TEST REPORT 3.3.1.3 (continued)

Plug No.	No. of pins measured	Results
300A1J14	63	All pins read greater than 20 megohms except pins No. 20 and 21 which are grounded to structure per drawing.
300A1J15	63	
300A1J16	63	
300A1J17	63	
300A1J18	63	

Resistance between isolated conductors was greater than 20 megohms.

TEST REPORT 3.3.1.4

TITLE

Launch Control Console Bonding Provisions

OBJECTIVE

To determine if proper provision for structure return paths exist for the Launch Control Console per BAC 5117

CONCLUSIONS

a. The test objective was realised.

b. The bonding provisions met the requirements of BAC 5117.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243 - Serial No. 0000001, 25-24172-11
Milliohmmeter - Keithly 502

TEST DESCRIPTION

a. Structure and mating material surfaces were examined for proper bonding techniques per BAC 5117.

b. The resistance from each module and/or subassembly to basic structure was measured

SUMMARY OF TEST RESULTS

a. The structure and mating material surfaces conform with proper bonding techniques per BAC 5117.

b. The resistances were less than the maximum of .0025 ohms called out in BAC 5117.

c. The resistances of each assembly and/or module is listed in Figure 3.3.1.4-1.

GENERAL INFORMATION

Test Engineers M. E. Novak — Organization 2-6524-4
T. G. McCarthy — 2-6524-4
Charge to EWA No. 3007
Date Test Started 6-28-62
Date Test Completed 7-05-62
Location Bldg. 9-120, Bay B-9, Plant DC

TEST REPORT 3.3.1.4 (Continued)

Module or Assembly	Resistance From Assembly to Structure (ohms)
1. Missile Status and Launcher Indicator Drawing 25-24172	.00020
2. Missile Status and Launcher Indicator, Drawing 25-24175	.00020
3. Missile Status and Launcher Indicator, Drawing 25-24175	.00015
4. Missile Status and Launcher Indicator, Drawing 25-24175	.00025
5. Missile Status and Launcher Indicator, Drawing 25-24175	.00020
6. Alarm and Monitor Panel 25-24176	.00020
7. Program Control Panel 25-24177	.00015
8. Launch Control Panel 25-24178	Not available at the time of this test.
9. DC Power Filter 25-24179	.00025
10. Alarm Control 25-24180	.00030
11. Audible Alarm Assembly 25-24181	.00010
12 Telephone Transmitter Control RCA 1274013	.00030

TEST REPORT 3.3.2.1

TITLE

Maintainability of the Launch Control Console

OBJECTIVE

To inspect the Launch Control Console from the maintenance standpoint.

CONCLUSIONS

a. The test objective was realized.

b. The Launch Control Console met the requirements of the Model Specification D2-5450, except for descrepancies listed in Summary of test results.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0000001

Scale, 0 - 150 lbs capacity

Scale, 0 - 1000 lbs capacity

TEST DESCRIPTION

The Launch Control Console (OA-3384/GSW-4) and the components and subsystems listed below,

a.	Launch Control Console Assembly	25-24172-11
b.	Pedestal Structure Assembly	25-24192-22
c.	Missile Status Launcher Indicator	25-24175-6
d.	Alarm and Monitor Panel	25-24176-15
e.	Program Control Panel	25-24177-10
f.	Launch Control Panel	25-24178-18
g.	DC Power Filter	25-24179-14
h.	Alarm Control	25-24180-13
i	Audible Alarm Assembly	25-24181-15
j.	Telephone Transmitter Control	1274013-503

were examined for the following:

1. Evaluation of handling methods required for complete console and major subassemblies.

2. Ease of removal and/or access

3. Weight

TEST DESCRIPTION (Continued)

4. Number of personnel required for removal and/or replacement.
5. Time required for removal and/or replacement.
6. Skill level of personnel required for maintenance and handling.
7. Evaluation of techniques required for handling and/or storage.
8. Mating of connectors, possibility of damage due to misalignment or play.
9. Cable runs and placement; possibility of damage by chaffing during removal and/or replacement of panels and modules.
10. Protrusions or sharp edges which may cause injury to personnel or damage to panels or modules during handling.
11. Procedures were recorded that were required by design to handle, remove and replace the panels and modules.
12. Items by which failure rates, maintenance and cost may be reduced were recorded.

SUMMARY OF TEST RESULTS

a. Time for removal and replacement and wights of assemblies are listed below.

Module of Assembly		Remove	Replace	Weight
Missile Status Launcher Indicator	25-24175	2 min.	2 min.	13.33 lbs
Alarm and Monitor Panel	25-24175	2.5 "	4.5 "	6.66 "
Program Control Panel	25-24177	1.8 "	1.5 "	9.20 "
Launch Control Panel	25-24178	2.0 "	2.0 "	31.75 "
DC Power Filter	25-24179	2.0 "	3.0 "	11.75 "
Alarm Control	25-24180	0.5 "	0.9 "	11.75 "
Audible Alarm Assembly	25-24181	0.25	0.4 "	20.5
Communication Control Panel RCA 1274013		5 "	13 "	49.25 "
Total weight of Console		----	----	609.00 lbs

b. Weights:

1. All assemblies require one man for installation and/or removal except the Communication Control Panel, which requires 2 men.

2. The total weight of the console is in excess of the 550 lbs maximum allowable per D2-5450 by 59 lbs.

SUMMARY OF TEST RESULTS (Continued)

c. Twenty per cent of the fasteners used to install the panels were found defective. The spring washer (BACF34D4R) used to retain the fasteners in place either borke or fell off prior to or during the panel removal. The fasteners (BACF34D4B6) are made of soft metal and are prone to chaffing, misalignment, and in one case sheared off completely. Metal filings, washers, and fasteners falling into the console could cause shorts and serious damage to the equipment. Stronger materials or a new fastener system could reduce the possibility of damage to the console.

d. More time is required for installation of the Telephone Transmitter control than for removal due to the retainer chains on the connector dust covers catching between the panels and the console structure. Nicks and scratches on the equipment were attributed to this condition. Per Drawing 25-24172, Console, Launch Control, all connector dust caps are to be removed and discarded upon base installation except the dust cap on A1A8J2, which shall remain permanently affixed to the console. Therefore, this problem is eliminated after base installation. Possible solutions to avoid this interference are:

1. Shortening the chain
2. Taping the chain out of the way before installation
3. Removing the chain before installation
4. Use plastic dust covers

e. All other items under the Test Description were found to be satisfactory from a maintainability standpoint

GENERAL INFORMATION

Test Engineers: M. E. Novak Organization 2-6524-4

T. G. McCarthy 2-6524-4

Charge to EWA No. 3007

Date Test Started 6-28-62

Date Test Completed 7-05-62

Location Bldg. 9-120; Bay E-9; Plant DC

TEST REPORT 3.3.2.2

TITLE

Maintainability of the Telephone Transmitter Control C-3937/GSQ

OBJECTIVE

To ensure satisfactory maintenance of the Telephone Transmitter Control.

CONCLUSIONS

a. The test objective was realized.

b. The Telephone Transmitter control met the requirements of the Model Specification D2-5450

ITEMS IN TEST

Telephone Transmitter Control RCA 1274013, part of Figure "A" 1243 Launch Control Console

Scale, 0-150 lbs capacity

TEST DESCRIPTION

a. The Telephone Transmitter Control was weighed.

b. Time for removal and replacement was recorded.

c. Cable runs were checked for chaffing or pinching during removal and/or replacement.

d. The panel was examined for sharp edges and corners which may cause injury to personnel or damage to the panel during handling.

SUMMARY OF TEST RESULTS

a. Time for removal of the panel was 4 minutes. Time for replacement was 13 minutes.

b. The panel weighs 49.75 lbs. Two men are required to handle the panel.

c. Maintenance requires common hand tools and can be accomplished by all skill levels of maintenance personnel.

d. Replacement of the panel was slow due to chains hanging from dust covers.

e. Maintainability was satisfactory in all other areas.

DESIGN IMPROVEMENT AREAS

a. Twenty per cent of the fasteners used to install the panel were found defective. The spring washers (BACF34D4R) used to retain the fasteners in place either broke or fell off prior to or during the panel removal. The fasteners (BACF34D4B6) are made of soft metal and are prone to chaffing, misalignment, and in one case sheared off completely. Metal filings, washers and fasteners falling into the console could cause shorts and serious damage to the equipment. Stronger materials or a new fastener system could reduce the possibility of damage to the console.

b. More time is required for installation of the panel than for removal due to the retainer chains on the connector dust covers catching between the panel and the console structure. Nicks and scratches on the equipment were attributed to this condition. Per Drawing 25-24172, Console, Launch Control, all connector dust caps are to be removed and discarded upon base installation. Therefore, this problem is eliminated after base installation.

GENERAL INFORMATION

Test Engineers M. E. Novak Organization 2-6524-4

Charge to EWA NO. 3007

Date Test Started 6-28-62

Date Test Completed 7-05-62

Location 9-120 Bldg; Bay E-9; Plant DC

TEST REPORT 3.3.3.1

TITLE

Launch Control Console Acceptance Functional Test Procedures Evaluation - D2-6913, Volume I

OBJECTIVE

To evaluate the acceptance Functional Test Procedures for the Launch Control Console at the card level.

CONCLUSIONS:

(a) The test objective was realized

(b) The Acceptance Functional Test Procedures will meet the requirements of the Model Specification D2-5450

ITEMS IN TEST:

Launch Control Console, Figure "A" 1243

Power Supply, 28 VDC ± 0.5, 15 amperes capacity, ripple 0.25 peak-to-peak maximum Kepko Model SC-32-15A

DC Voltmeter, 0 to 30 VDC, Accuracy ± 1 per cent Hewlett - Packard 412A

DC Microammeter ± 3 per cent at 0.5 microamperes full scale

Pulse Generator, Electro Pulse, 3450 C

Oscilloscope, Tektronix 545 with type K DC amplifier

Transistor, 2N174A

Diode, 1N250A

Resistor, 60 ohm, ± 3 per cent 50 W wirewound

Resistor, 2K ± 2 per cent 1W carbon

Resistor, 6K ± 2 per cent 1W carbon

Resistor, 500 ohm, ± 5 per cent, 1W carbon

Resistor, 40K ± 10 per cent, 1W carbon

TEST DESCRIPTION

The Acceptance Functional Test Procedures, Paragraphs 6.0 through 8.2.4.14 of D2-6913, for the alarm control PCA 25-25539 and the Display Module PCA 25-25540 were evaluated from the following standpoints.

a. Each test complete and detailed enough to assure that the item being tested is acceptable and has no errors or malfunctions.

b. Any unnecessary tests or additional tests required.

TEST DESCRIPTION (continued)

c. Simplification of the test by evaluating:

1. Skill level of personnel required
2. Unrealistic tolerances specified
3. Test equipment required
4. Test set up hazardous to personnel and/or equipment
5. Procedures in proper sequence.

d. Procedures fulfill the requirements of D2-5450

SUMMARY OF TEST RESULTS

Evaluation of the Acceptance Functional Test Procedures and analysis of the use of these procedures by electronic manufacturing personnel resulted in the following:

a. The Acceptance Functional Test Procedures met the requirements of the Model Specification D2-5450.

b. No additional tests were required, nor were any unnecessary tests found.

c. Organization of the procedures, tolerances, test equipment and test set up are acceptable and no simplification is needed.

d. The document is acceptable in all other items listed under Test Description.

GENERAL INFORMATION

Test Engineers M. E. Novak Organization 2-6524-4

T. G. McCarthy 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-23-62

Date Test Completed 7-27-62

TEST REPORT 3.3.3.2

TITLE

Launch Control Console Acceptance Functional Test Procedures Evaluation - D2-6913, Volume II

OBJECTIVE

To evaluate the Acceptance Functional Test Procedures for the Launch Control Console at the panel and module level.

CONCLUSIONS

(a) The test objective was realized.

(b) The Acceptance Functional Test Procedures met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, 25-24172-11

28 ± 0.5 VDC Power Supply, 15 ampere capacity, ripple 0.25v peak-to-peak maximum, Kepco SC-32-15A

Ohmmeter, Triplett, 630A

Ohmmeter, Hewlett - Packard, 400L

Pulse Generator, Electro Pulse 3450C

Oscilloscope, Tektronix 545 with Type K DC amplifier

Oscilloscope, Tektronix 530 with 53/54 B plug-in unit with Beattie Oscillatron Camera Model 12445

Sound Level Meter, General Radio 1551A

150 VDC Power Supply, Sorenson 600B

Signal Generator, Audio, Hewlett - Packard 200AB

Resistor, 2K ± 2%, 1W, carbon

Resistor, 60 ohms ± 3%, 50W, wirewound

Resistor, 4 ohms, ± 100%, 500W, wirewound

Resistor, 5 ohms, ± 10%, 1/2W, carbon

Resistor, 10K ±%, 1W, carbon

Resistor, 51 ohms, ± 10%, 1W, carbon

Resistor, 4.3K, ± 10%, 1W, carbon

Resistor, 600 ohms, ± 10%, 2W, carbon (2 each)

ITEMS IN TEST (continued)

Capacitor, 1 microfarad, 600 VDC, Paper

Capacitor, 1 microfarad, 600 VDC, paper

Capacitor, 10 microfarads, 200 VDC, paper

Silicon Controlled Rectifier, Type C35B

Switch, DPDT, 10 ampere contact rating

Switch, SPST, 1 ampere contact rating

Adapter, Display Module, MIT 24-25175

Adapter, Alarm and Monitor Panel, MIT 24-25176

Adapter, Program Control Panel, MIT 24-25177

Adapter, Launch Control Panel, MIT 24-25178

Adapter, DC Power Filter, MIT 24-25179

Adapter, Alarm Control, MIT 24-25180

Adapter, Audible Alarm, MIT 24-25181

Adapter, Telephone Transmitter Control

Switch Activator, TSJ 25-24178

Code Setter, 25-25421

Switch Activator, TSJ 25-24177

TEST DESCRIPTION

Evaluation of the Acceptance Functional Test Procedures for the panels and modules:

Missile Status Launcher Indicator	25-24175
Alarm and Monitor Panel	25-24176
Program Control Panel	25-24177
Launch Control Panel	25-24178
DC Power Filter	25-24179
Alarm Control	25-24180
Audible Alarm Assembly	25-24181
Telephone Transmitter Control	1274013-503

The Acceptance Functional Test was performed as specified in Paragraph 8.0 through 8.8.1 of D2-6913, Volume II, Section 2, and evaluated from the following standpoints:

a. Each test complete and detailed enough to assure that the item being tested is acceptable and that there are no malfunctions and/or errors at the lowest possible level of testing.

b. Any unnecessary tests

TEST DESCRIPTION (continued)

c. Any additional tests required.

d. Skill level of personnel required.

e. Unrealistic tolerances specified.

f. Test equipment required.

g. Test set up hazardous to personnel or equipment.

h. Procedures in proper sequence.

i. Procedures fulfill the requirements of D2-5450.

SUMMARY OF TEST RESULTS

It was found that the Acceptance Functional Test Procedure could be improved somewhat by the changes listed below. However, these changes can be implemented at a general revision to the document and will have no effect on equipment already accepted.

1. A check for no continuity between Pin 21 and Pins 13, 27, 30, 63, 62, 52, 51, 19, 13, 1, 57, 58, 44, 20, 4, 45, 43, and 56 of P1 in the Indicator Launcher Missile Status test is necessary to assure circuit isolation from structure.

2. A check for no continuity between Pins 15 and 61 on P2 and 61 to 58 and 63 on P1 should be added to 8.3.2.2 of the test procedures to assure no shorts are present in the Program Control Panel.

3. The following tests should be deleted from Table 3 because the points are not involved in the circuit of the Launch Control Panel.

Adapter	Pin	Adapter	Pin	Status
J1	2	J1	60-62	NC
J1	3	J1	60-62	NC
J1	4	J1	60-62	NC
J1	5	J1	60-62	NC
J1	6	J1	60-62	NC
J1	7	J1	60-62	NC
J1	8	J1	60-62	NC
J1	9	J1	60-62	NC
J1	10	J1	60-62	NC
J1	11	J1	60-62	NC
J1	12	J1	60-62	NC
J1	13	J1	60-62	NC
J1	14	J1	60-62	NC
J1	15	J1	60-62	NC
J1	57	J1	60 & 61	NC

SUMMARY OF TEST RESULTS (Continued)

4. Launch Control Panel plug J2, Pin 60 and 61 should be checked for no continuity to structure to assure circuit isolation from structure.

5. Paragraph 8.7.2.3 should specify separate benches for the alarm and the sound level measurement instrument to eliminate mechanical conduction of sound. It should also specify the position of the instrument with respect to the sound outlet on the alarm to standardize the test.

6. Paragraph 8.7.2.5 should call out a maximum allowable noise ambient so that the noise will not adversely effect the buzzer alarm test.

7. The bell test, Paragraph 8.7.3.1, should be standardized with the buzzer test, Paragraph 8.7.2.3.

8. Paragraph 8.7.3.3 should call out a maximum allowable noise ambient so that the noise will not adversely effect the bell alarm test.

9. The procedures were acceptable in all other items listed under Test Description.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-24-62

Date Test Completed 8-8-62

Location: 9-120 Bldg: Bay E-9: Plant, DC

TEST REPORT 3.3.3.3

TITLE

Launch Control Console Acceptance Functional Test Procedures Evaluation - D2-6913, Volume III, Section 2, Paragraphs 8.0 to 8.9.

OBJECTIVE

To evaluate the Acceptance Functional Test Procedures for the Launch Control Console at the console level.

CONCLUSIONS

(a) The test objective was realized.

(b) The Acceptance Functional Test Procedures met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Launch Control Console - 25-24172-11

35 volts DC Power Supply, 5 ampere capacity - Trygon M35-5

Ohmmeter, Triplett 630A

Sound level meter - General Radio 1551A

Resistor, 3K, ± 10 per cent 1/2 W

Adapter, equivalent to MIT 25-24172

TEST DESCRIPTION

The Acceptance Functional Test Procedures for the Launch Control Console, 25-24172-11 were performed and evaluated from the following standpoints:

a. Each test complete and detailed enough to assure that the item being tested is acceptable
b. Testing detailed enough to show up any malfunctions and/or errors at the lowest possible level of testing.
c. Any unnecessary tests.
d. Any additional tests required.
e. To see if test procedure can be simplified by evaluating:

    1. Skill level of personnel required.
    2. Unrealistic tolerances required.
    3. Test equipment required.
    4. Test set-up hazardous to personnel and/or equipment.
    5. Procedures in proper sequence.
    6. Procedures fulfill the requirements of D2-5450.

SUMMARY OF TEST RESULTS

It was found that Acceptance Functional Test Procedures could be improved somewhat by the changes listed below. However, these changes can be implemented at a general revision to the document and will have no effect on equipment already accepted.

(a) During the Audible Alarm tests, the ambient noise is near the alarms output level and in some instances cause some difficulty in obtaining valid measurements.

(b) No unnecessary tests were found, nor were any additional test required.

(c) The Functional test could be completed in less time by inclusion of the following:

1. Call out test equipment equivalents in the document.
2. Rearrange the order of testing of plug pins so that all the tdsts are performed on each plug before moving on to the next.
3. Redesign adapter MIT 25-24172-16 to a more convenient configuration.
4. Rearrange pin callout order of the table on Page 25, Section 2 to read in sequence.

(d) All other items under Test Description were satisfactory.

GENERAL INFORMATION

TEST ENGINEERS T. G. McCarthy Organization 2-6524-4

M. E. Novak

Charge to EWA No. 3007

Date Test Started 7-23-62

Date Test Completed 7-27-62

TEST REPORT 3.3.4.1

TITLE

Temperature of Launch Control Console Components

OBJECTIVE

To determine the operating temperature of vital points in the Launch Control Console.

CONCLUSIONS

a. The test objective was realized.

b. The component temperatures did not exceed the limitations of Minuteman Electronic Parts as called out in D-590, Books 30, 30A and 30B.

c. The Launch Control Console met the requirements specified in the Model Specification D2-5450.

d. The results of the test are directly applicable to the BC-1 LCC, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Unit 0002, 25-24172-7

Thermocouples, Iron Constantan

Temperature Meter, Iron Constantan direct reading

Thermometer, Degree F

DC Power Supply, Invar TP-15

Adapter - Thermocouple

Adapter - DC Power

Adapter - AC Power

TEST DESCRIPTION

a. Fifty-two thermocouples were located on the Launch Control Console as tabulated on Figure 3.3.4.1-8 and indicated by the sketches on Figure 3.3.4.1-2 through 3.3.4.1-7.

b. Area ambient air temperatures were recorded.

c. Readings of thermocouples were recorded after steady state temperature conditions were reached with a nominal DC input voltage of 28 VDC for the following operational modes of the Launch Control Console:

TEST DESCRIPTION (Continued)

1. One status indicator illuminated for each launcher.
2. Two status indicators illuminated for each launcher.
3. Three status indicators illuminated for each launcher.
4. Four status indicators illuminated for each launcher.
5. Five status indicators illuminated for each launcher.
6. Six status indicators illuminated for each launcher.
7. Ten status indicators illuminated for Launcher 5 and 6 (middle module) and five status indicators illuminated for Launchers 1, 2, 3, 4, 7, 8, 9 and 10.

d. Readings of thermocouples were recorded after steady state temperature conditions were reached with mode c.7 above and the following:

1. Alarm No. 1 activated
2. Alarm No. 2 activated
3. Alarm No. 1 and No. 2 activated

e. Test Setup (See Figure 3.3.4.1-1)

SUMMARY OF TEST RESULTS:

a. Although the component temperature did not exceed the limitations of Minuteman Electronic parts, the following was noted:

1. Alarm and Monitor Panel 25-24176, Card A_2, Resistor R_7 and R_8 have temperatures exceeding the maximum allowable temperature of 150°F for epoxy, and hence should not be encapsulated.

2. Alarm and Monitor Panel 25-24176, Card A_2, R_8, a ten-watt resistor is mounted too close to the one-watt resistor (R_7). The amount of power dissipated by R_8 is affecting the temperature of R_7; therefore, a heat sink should be required for R_8, and R_8 should be relocated away from R_7.

3. DC Power Filter 25-24179; the four diodes are operating near the recommended maximum temperature of 47.5°C at the junction of the diode. The junction temperature was calculated from the data as 42.85°C.

b. The temperature change in the components of the Launch Control Console is as follows:

1. Change between ten status indicators illuminated and sixty status indicators illuminated with both bell and buzzer activated.

Item	Temperature Rise
(a) Power Resistor 29-19870	7°F
(b) Alarm and Monitor Panel 25-24176	
R_7	8°F
R_8	6°F
(c) DC Power Filter 25-24179	
Diodes, Card A_3	17°F
Heat Sink Diodes	15°F
Capacitors C_2 and C_3	15°F
(d) Audible Alarm Assembly 25-24181	
Resistors R_1 and R_2	11°F
(e) Alarm Driver Assembly 25-24180	
Diodes, CR_1 through CR_4	7°F
Bracket, Diode	6°F
Power Transistors Q_1 and Q_2	6°F
Heat Sink, Power Transistors	6°F
Transistor Q_1, Card A_1	7°F
Transistor Q_2, Card A_1	7°F
Resistor R_2, Card A_1	7°F
Resistor R_{10}, Card A_1	14°F
Resistor R_{13}, Card A_1	21°F
Transistor Q_1, Card A_2	8°F
Transistor Q_2, Card A_2	8°F
Resistor R_2, Card A_2	7°F
Resistor R_{10}, Card A_2	18°F
Resistor R_{13}, Card A_2	20°F
(f) Missile Status Launcher Indicator 25-24175	
Top of Module	32°F

2. Change between code dissipate light on and code dissipate light off.

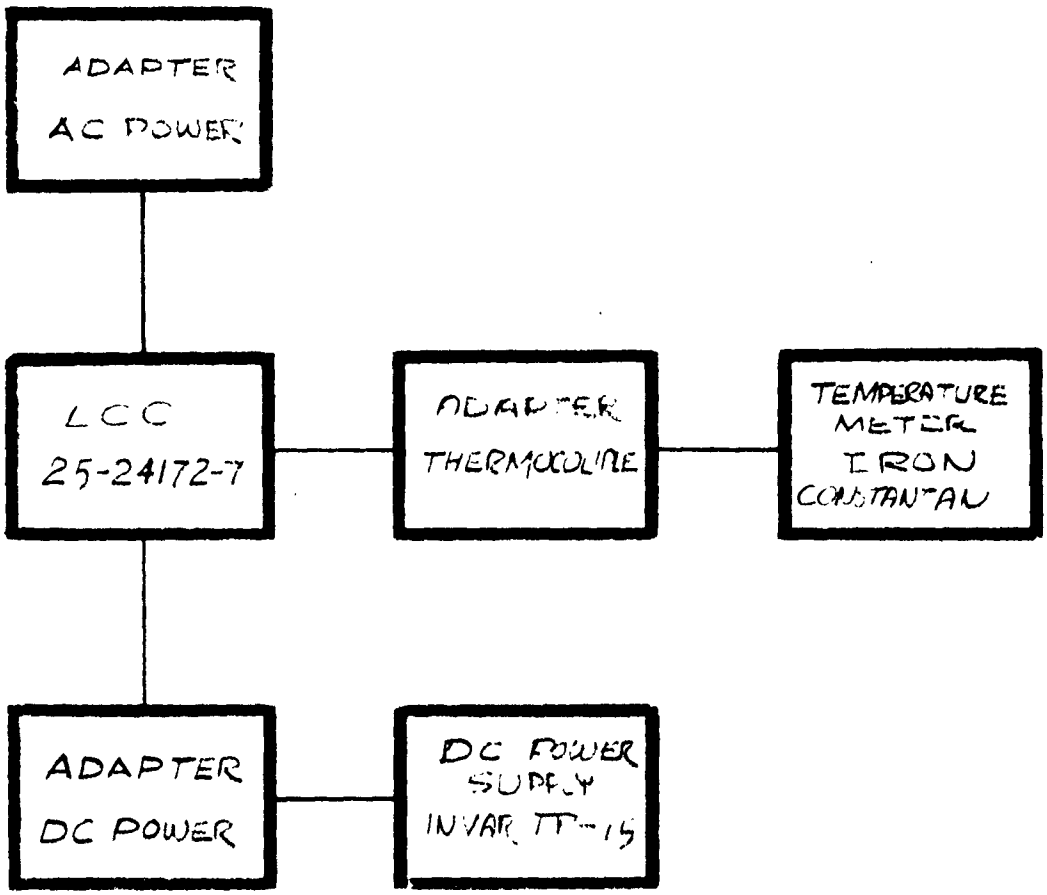
Alarm and Monitor Panel 25-24172	
R_7	110°F
R_8	115°F

The change in temperature for (1) above does not appear critical. For (2) there is a large temperature rise when the code dissipate light is turned OFF (this is shown on Figure 3.3.4.1-8). This is the normal condition when the Launch Control Panel is installed into the Launch Control Console.

c. The data obtained for the temperature analysis of the Launch Control Console is seen on Figure 3.3.4.1-8.

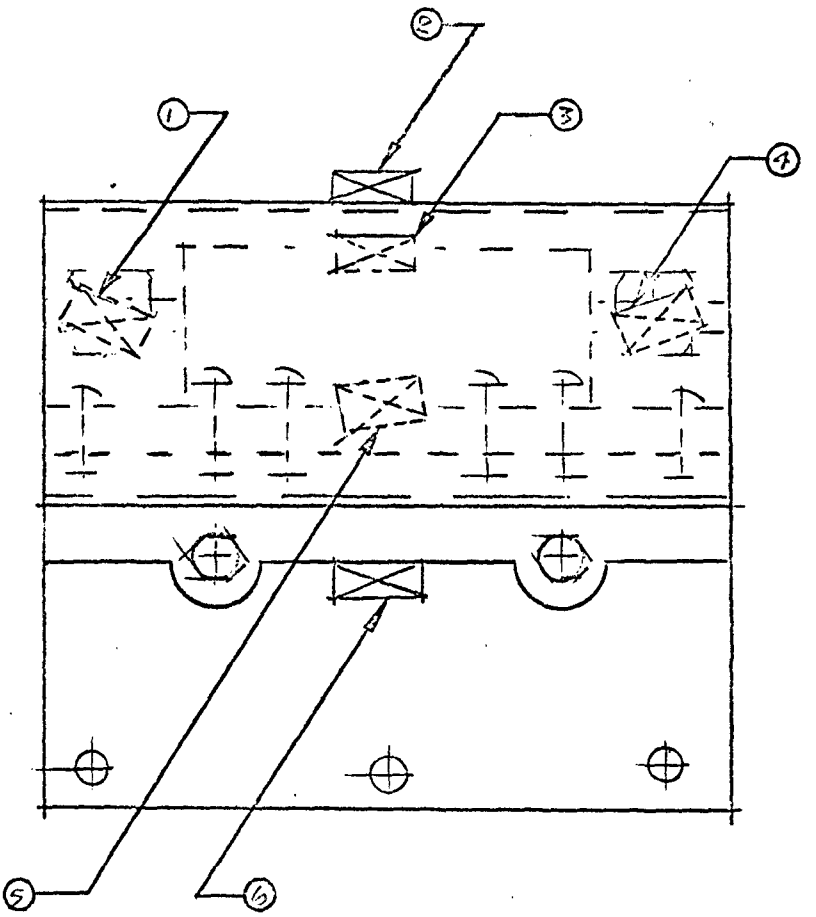
GENERAL INFORMATION

Test Engineer T. G. McCarthy Organization 2-6524-4
Charge to EWA No. 3007
Date Test Started 4-03-62
Date Test Completed 5-01-62 Location 9.20 Bldg; Bay E-9; DC



CALC			REVISED	DATE	FIGURE 3.3.4.1-1 TEST SETUP TEMPERATURE OF LCC COMPONENTS	T2-2564
CHECK						Vol. 3 Sec. 3
APPD						
APPD					THE BOEING COMPANY	PAGE 150

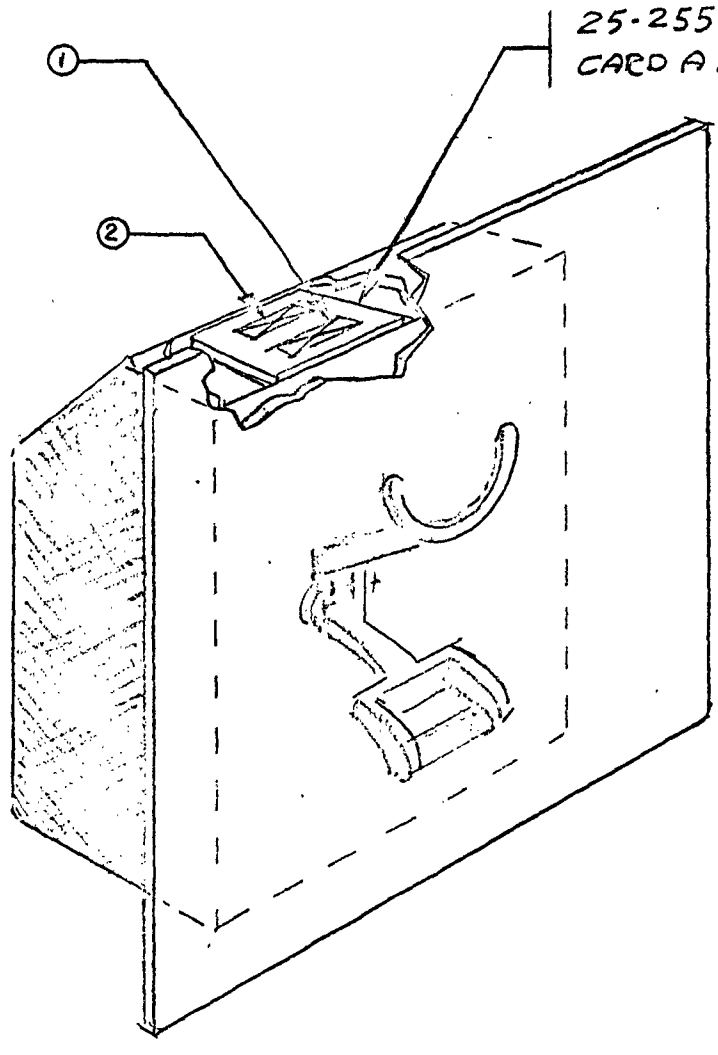
U3 4036 3000 REQ 10388



THERMOCOUPLE LOCATIONS :

1. RESISTOR STUD (OUTBOARD)
2. SHIELD ABOVE RESISTOR
3. RESISTOR BODY ON TOP
4. RESISTOR STUD (INBOARD)
5. RESISTOR BODY NEXT TO HEAT SINK
6. RESISTOR HEAT SINK

			REVISED	DATE	FIGURE 3.3.4.1-2 POWER RESISTOR 29-19870 TEMPERATURE OF LCC COMPONENTS	T2-2564 ~~Vol. 3~~ Sec. 3
CALC						
CHECK						
APPD						
APPD					THE BOEING COMPANY	PAGE 15d

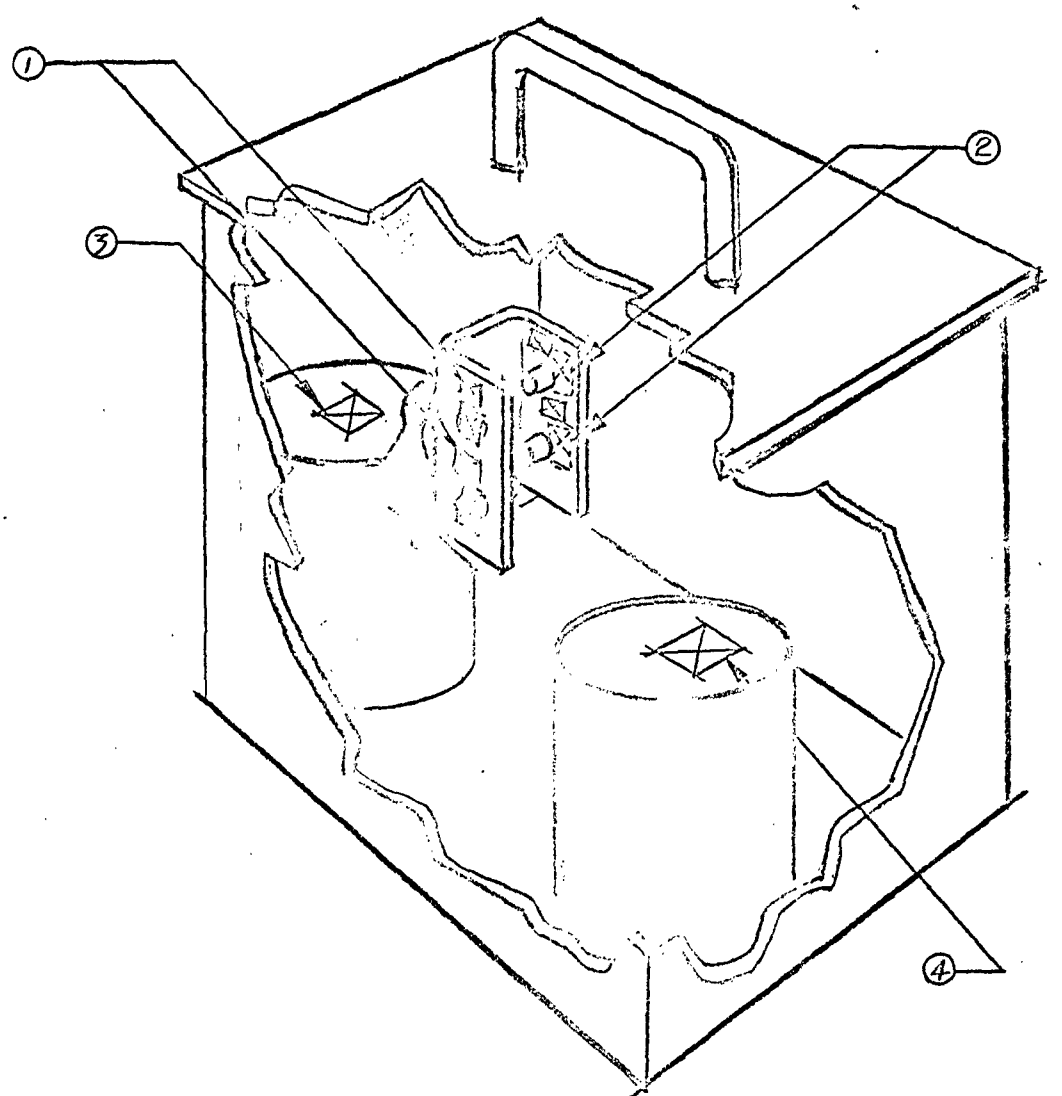


THERMOCOUPLE LOCATIONS:

① RESISTOR R7 - CARD A2

② RESISTOR R[illegible] - CARD A2

CALC			REVISED	DATE	FIGURE 3.3.4.1-3 ALARM & MONITOR, 25-24176 TEMPERATURE OF LCC COMPONENTS	T2-2564 ~~Vol. 3~~ Sec. 3
CHECK						
APPD						
APPD						
					THE BOEING COMPANY	PAGE 15a



THERMOCOUPLE LOCATIONS:

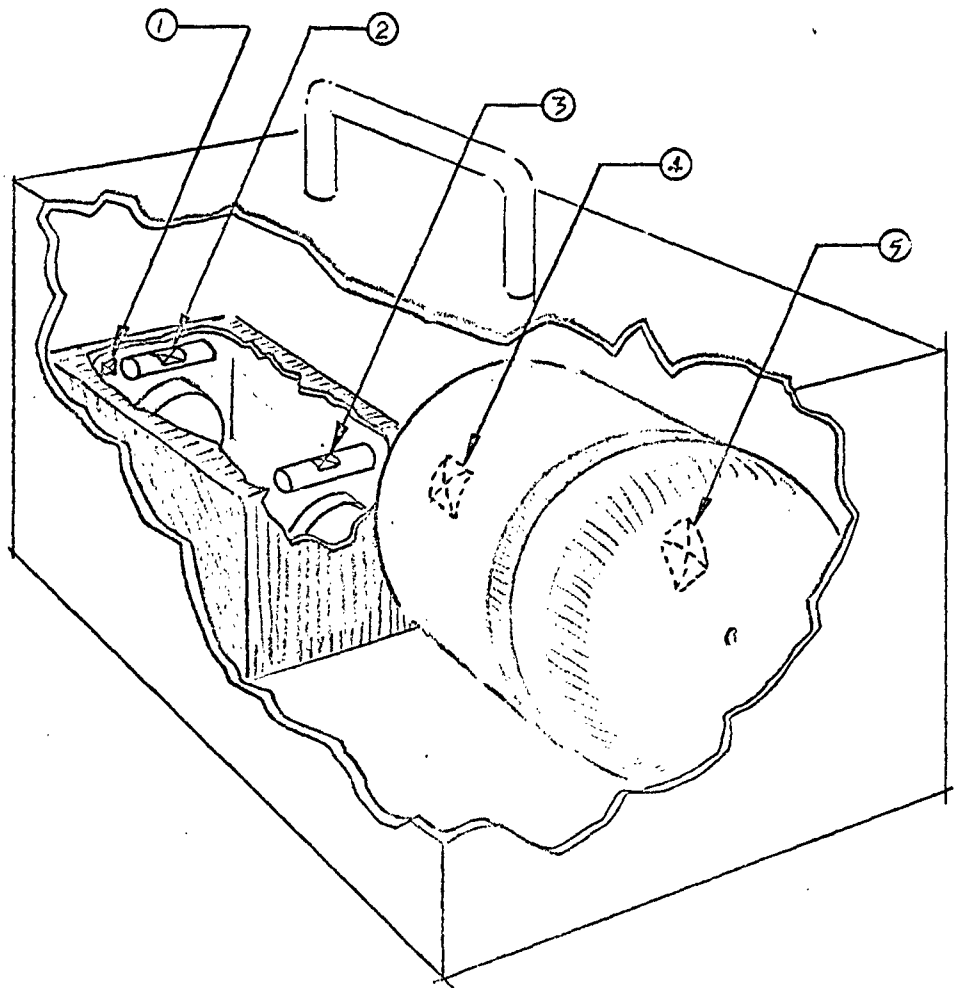
1. DIODE HEAT SINK TYPICAL 4 PLACES
2. DIODE TYPICAL 4 PLACES
3. CAPACITOR C2
4. CAPACITOR C3

CALC			REVISED	DATE
CHECK				
APPD				
APPD				

FIGURE 3.3.4.1-4
DC POWER FILTER, 25-24179
TEMPERATURE OF LCC COMPONENTS

THE BOEING COMPANY

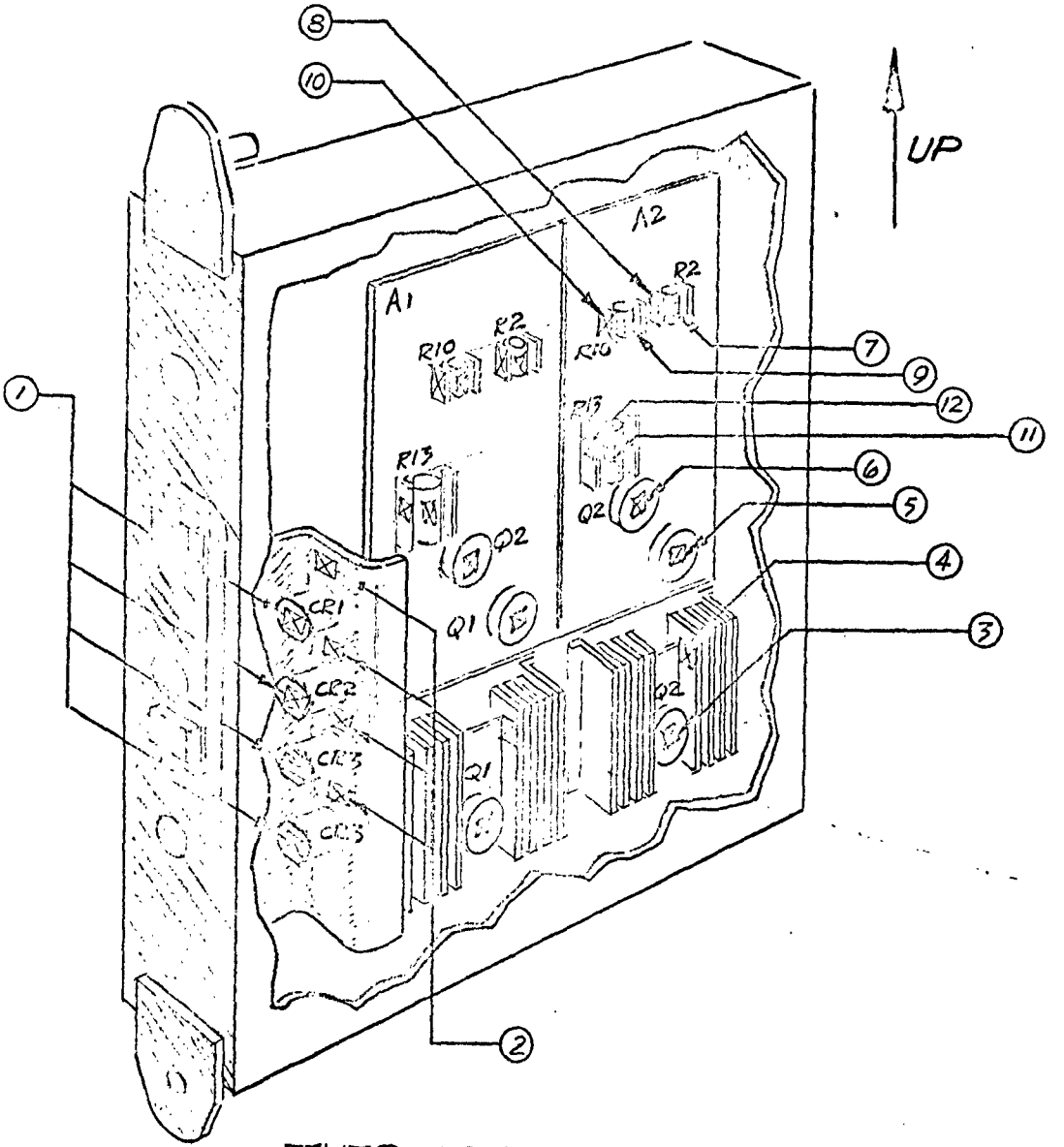
T2-2564
~~Vol. 3~~
Sec. 3



THERMOCOUPLE LOCATIONS:

1. STRUCTRURE NEXT TO RESISTOR R1
2. RESISTOR R1
3. RESISTOR R2
4. BUZZER COIL
5. BELL COIL

CALC			REVISED	DATE	FIGURE 3.3.4.1-5 AUDIBLE ALARM ASSY, 25-24181 TEMPERATURE OF LCC COMPONENTS	T2-2564 ~~Vol. 3~~ Sec. 3
CHECK						
APPD						
APPD					BOEING AIRPLANE COMPANY	PAGE 158

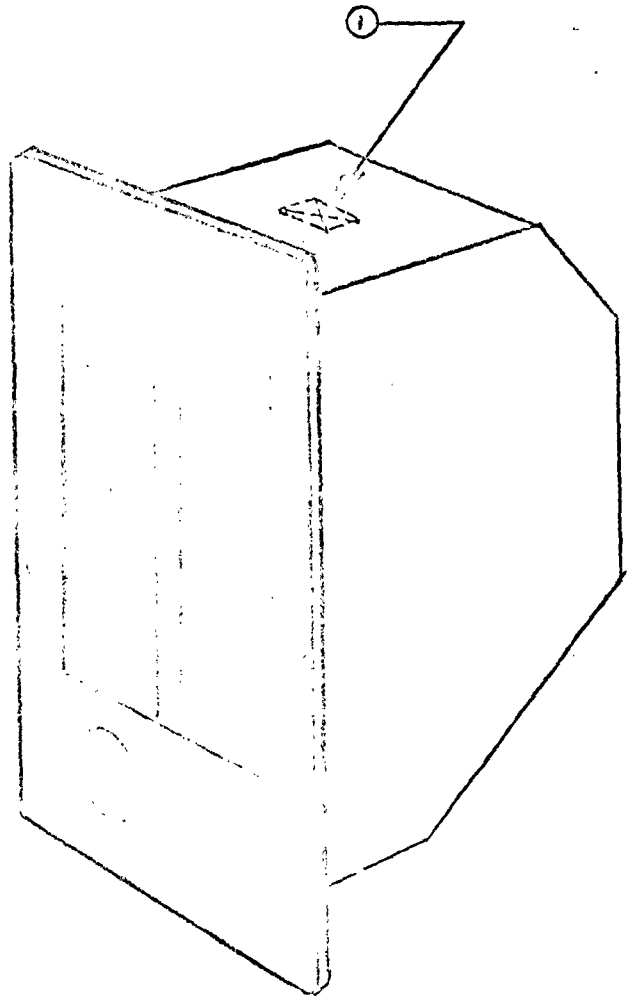


THERMOCOUPLE LOCATIONS:

(1) DIODE CR1 THRU CR4 (2) BRACKET CR1 THRU CR4
(3) TRANSISTOR Q2 (TYP. TRANSISTOR Q1). (4) HEATSINK Q2 (TYP. HEATSINK Q1)
(5) TRANSISTOR Q1, CARD A2 (TYP. CARD A1) (6) TRANSISTOR Q2, CARD A2 (TYP. CARD A1)
(7) RESISTOR R2, CARD A2 (TYP. CARD A1) (8) HEATSINK R2, CARD A2 (TYP. CARD A1)
(9) RESISTOR R10, CARD A2 (TYP. CARD A1) (10) HEATSINK R10, CARD A2 (TYP. CARD A1)
(11) RESISTOR A13, CARD A2 (TYP. CARD A1) (12) HEATSINK R13, CARD A2 (TYP. CARD A1)

CALC			REVISED	DATE	FIGURE 3.3.4.1-6	T2-2564
CHECK					ALARM DRIVER ASSY, 25-24180	Vol. 3
APPD					TEMPERATURE OF LCC COMPONENTS	Sec. 3
APPD					THE BOEING COMPANY	PAGE 15h

U3 4036 3000 REQ 10388



THERMOCOUPLE LOCATION:

1. AIR - INSIDE TOP OF LAMP COMPARTMENT

CALC			REVISED	DATE
CHECK				
APPD				
APPD				

FIGURE 3.3.4.1-7
MISSILE STATUS LAUNCHER INDICATOR — TEMPERATURE OF LCC COMPARTMENTS

THE BOEING COMPANY

T2-2564
~~Vol. 3~~
Sec. 3

PAGE 151

U3 4036 3000 REQ 10388

FIGURE 3.3.4.1-8

MAXIMUM TEMPERATURE (°F) LCC COMPONENTS

28 VDC ± 0.5V

	AMBIENT TEMPERATURE	POWER RESISTOR 29-19870						ALARM MONITO 25-24176			
		HEAT SINK	RESISTOR BODY NEXT TO HEAT SINK	RESISTOR BODY ON TOP	STUD OUTBOARD	STUD INBOARD	SHIELD ABOVE RESISTOR	CODE DISSIPATE OFF		CODE DISSIPA ON	
								RT(A2)	R8(A2)	RT(A2)	D0(A2)
1 ONE STATUS INDICATOR ILLUMINATED FOR EACH LAUNCHER	75	96	140	142	146	148	106	202	216		
2 TWO STATUS INDICATORS ILLUMINATED FOR EACH LAUNCHER	76	100	144	146	149	151	106	203	216		
3 THREE STATUS INDICATORS ILLUMINATED FOR EACH LAUNCHER	77	100	146	148	152	154	110	206	219		
4 FOUR STATUS INDICATORS ILLUMINATED FOR EACH LAUNCHER	77	102	147	149	152	155	112	206	219		
5 FIVE STATUS INDICATORS ILLUMINATED FOR EACH LAUNCHER	77	100	144	147	150	153	110			100	10
6 SIX STATUS INDICATORS ILLUMINATED FOR EACH LAUNCHER	78	100	145	146	150	152	110			100	10
7 TEN STATUS INDICATORS ILLUMINATED FOR LAUNCHERS 5 & 6 AND FIVE STATUS INDICATORS FOR ALL OTHER LAUNCHERS	79	100	145	146	150	152	110	210	222		
8 REPEAT 7 WITH ALARM #1 ACTUATED	79	102	145	146	150	152	110			101	10
9 REPEAT 7 WITH ALARM #2 ACTUATED	79	102	145	146	150	152	110			101	10
10 REPEAT 7 WITH ALARM #1 & 2 ACTUATED	79	102	145	146	150	152	110			101	10

REVISED

BAC 4339

VER RESISTOR 3-19870					ALARM MONITOR 25-24176				DC FILTER ASSEMBLY 25-24179										AUD 25
					CODE DISSIPATE OFF		CODE DISSIPATE ON												
NEXT TO HEAT SINK	RESISTOR BODY ON TOP	STUD OUTBOARD	STUD INBOARD	SHIELD ABOVE RESISTOR	R7(A2)	R8(A2)	R7(A2)	R8(A2)	DIODE CR1(A3)	DIODE CR2(A3)	DIODE CR3(A3)	DIODE CR4(A3)	HEAT SINK CR1	HEAT SINK CR2	HEAT SINK CR3	HEAT SINK CR4	CAPACITOR C2	CAPACITOR C3	TOP CENTER R1(A1)	
10	142	146	148	106	202	216			88	84	87	88	88	86	86	86	79	79	75	7
14	146	149	151	106	203	216			92	86	90	92	92	90	90	91	81	80	76	7
16	148	152	154	110	206	219			98	92	96	98	96	94	96	96	86	86	78	7
17	149	152	155	112	206	219			102	96	100	102	100	98	100	100	92	91	78	7
14	147	150	153	110			100	107	102	100	103	103	100	97	100	100	90	89	75	7
15	146	150	152	110			100	108	104	102	105	105	102	98	102	102	90	89	75	7
15	146	150	152	110	210	222			106	103	106	106	102	100	103	103	93	91	76	7
15	146	150	152	110			101	108	106	103	106	106	103	100	104	104	94	92	76	7
15	146	150	152	110			101	109	106	103	106	106	103	100	104	104	94	92	78	8
15	146	150	152	110			101	109	105	103	106	106	103	100	103	104	94	92	86	8

ALARM MONITOR 25-24176				DC FILTER ASSEMBLY 25-24179										AUDIBLE ALARM ASSY. 25-24181				
CODE DISSIPATE OFF		CODE DISSIPATE ON																
R7(A2)	R8(A2)	R7(A2)	R8(A2)	DIODE CR1(A3)	DIODE CR2(A3)	DIODE CR3(A3)	DIODE CR4(A3)	HEAT SINK CR1	HEAT SINK CR2	HEAT SINK CR3	HEAT SINK CR4	CAPACITOR C2	CAPACITOR C3	TOP CENTER R1(A1)	STRUCTURE NEXT TO R1	TOP CENTER R2(A1)	BELL COIL	BUZZER COIL
202	216			88	84	87	88	88	86	86	86	79	79	75	75	75	75	75
203	216			92	86	90	92	92	90	90	91	81	80	76	77	77	78	78
206	219			98	92	96	98	96	94	96	96	86	86	78	78	78	78	78
206	219			102	96	100	102	100	98	100	100	92	91	78	78	78	78	78
		100	107	102	100	103	103	100	97	100	100	90	89	75	75	75	75	75
		100	108	104	102	105	105	102	98	102	102	90	89	75	75	75	75	75
210	222			106	103	106	106	102	100	103	103	93	91	76	76	76	76	76
		101	108	106	103	106	106	103	100	104	104	94	92	76	76	76	76	78
		101	109	106	103	106	106	103	100	104	104	94	92	78	82	82	78	79
		101	109	105	103	106	106	103	100	103	104	94	92	86	85	85	79	79

ALARM DRIVER A

FIGURE 3.3.4.1-8 MAX. TEMP. (°F) LCC COMP. 28 VDC ± 0.5 V	DIODE CR1	DIODE CR2	DIODE CR3	DIODE CR4	BRACKET CR1	BRACKET CR2	BRACKET CR3	BRACKET CR4	TRANSISTOR Q1	TRANSISTOR Q2	Q1 HEAT SINK	Q2 HEAT SINK	TRANSISTOR Q1 (AI)	TRANSISTOR
1	81	81	80	80	80	80	80	78	76	76	76	76	78	8
2	87	88	88	88	88	85	85	83	79	78	79	79	86	89
3	84	84	84	84	84	84	84	82	82	82	82	82	84	86
4	86	86	85	85	85	85	85	84	83	83	84	84	86	88
5	84	84	83	83	84	83	83	82	80	80	80	80	83	85
6	84	84	83	83	83	83	82	82	81	81	81	81	83	85
7	85	84	84	84	84	84	84	83	81	81	81	81	84	86
8	86	86	86	86	85	85	85	84	82	82	82	82	84	87
9	86	86	86	86	85	85	85	85	82	82	82	82	84	86
10	88	88	87	88	86	86	86	85	82	82	82	82	85	87

REVISED

BAC 4339

ALARM DRIVER ASSEMBLY 25-24180

BRACKET CR1	BRACKET CR2	BRACKET CR3	BRACKET CR4	TRANSISTOR Q1	TRANSISTOR Q2	Q1 HEAT SINK	Q2 HEAT SINK	TRANSISTOR Q1 (A1)	TRANSISTOR Q2 (A1)	TOP CENTER R2 (A1)	R2 HEAT SINK (A1)	TOP CENTER R10 (A1)	R10 HEAT SINK (A1)	TOP CENTER R13 (A1)	R13 HEAT SINK (A1)	TRANSISTOR Q1 (A2)	[illegible] Q2 (A2)	TOP CENTER R2 (A2)	R2 HEAT [illegible]
80	80	80	78	70	76	76	76	78	80	83	85	123	120	145	116	77	79	82	76
88	85	85	83	79	78	79	79	86	89	88	90	125	115	148	119	81	82	88	92
84	84	84	82	82	82	82	82	84	86	90	92	128	126	150	120	83	86	90	90
85	85	85	84	83	83	84	84	86	88	92	94	130	127	150	122	85	88	92	92
84	83	83	82	80	80	80	80	83	85	89	91	128	124	149	122	82	85	85	90
83	83	82	82	81	81	81	81	85	85	89	91	127	124	148	122	83	85	89	90
84	84	84	83	81	81	81	81	84	86	90	92	128	125	150	123	84	86	90	92
85	85	85	84	82	82	82	82	84	87	90	92	113	122	166	126	84	86	90	91
85	85	85	85	82	82	82	82	84	86	90	92	127	124	148	123	85	87	89	91
86	86	86	85	82	82	82	82	85	87	90	92	116	122	163	123	85	87	89	91

2

BOEI

DRIVER ASSEMBLY 25-24180

TRANSISTOR Q2	Q1 HEAT SINK	Q2 HEAT SINK	TRANSISTOR Q1 (A1)	TRANSISTOR Q2 (A1)	TOP CENTER R2 (A1)	R2 HEAT SINK (A1)	TOP CENTER R10 (A1)	R10 HEAT SINK (A1)	TOP CENTER R13 (A1)	R13 HEAT SINK (A1)	TRANSISTOR Q1 (A2)	TRANSISTOR Q2 (A2)	TOP CENTER R2 (A2)	R2 HEAT SINK (A2)	TOP CENTER R10 (A2)	R10 HEAT SINK (A2)	TOP CENTER R13 (A2)	R13 HEAT SINK (A2)	TOP OF DISPLAY MODULE
76	76	76	78	80	83	85	123	120	145	116	77	79	82	76	140	126	143	118	8
78	79	79	86	89	88	90	125	115	148	119	81	82	88	92	142	143	148	123	8
82	82	82	84	86	90	92	128	126	150	120	83	86	90	90	142	130	146	121	8
83	84	84	86	88	92	94	130	127	150	122	85	88	92	92	144	132	150	122	9
80	80	80	83	85	89	91	128	124	149	122	82	85	85	90	140	126	146	122	9
81	81	81	83	85	89	91	127	124	148	122	83	85	89	90	139	126	145	121	9
81	81	81	84	86	90	92	128	125	150	123	84	86	90	92	140	128	146	122	10
82	82	82	84	87	90	92	113	122	166	126	84	86	90	91	140	128	146	122	11
82	82	82	84	86	90	92	127	124	148	123	85	87	89	91	118	121	163	126	11
82	82	82	85	87	90	92	116	122	163	123	85	87	89	91	116	119	163	128	11

TEST REPORT 3.3.4.2

TITLE

Worst Case Temperature of Launch Control Console Components

OBJECTIVE

To determine the maximum operating temperature of vital points in the Launch Control Console

CONCLUSIONS

A. The test objective was realized.

b. The component temperatures did not exceed the limitations of Minuteman Electronic Parts as called out in D-590, Books 30, 30A, and 30B.

c. The Launch Control Console met the requirements specified in the Model Specification D2-5450.

d. The results of the test are directly applicable to the BC-1 LCC, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Unit 0002, 25-24172-7

Thermocouples, Iron Constantan

Temperature Meter, Iron Constantan direct reading

Thermometer, Degree F

DC Power Supply, Invar TP-15

Adapter - Thermocouple

Adapter - DC Power

Adapter - AC Power

TEST DESCRIPTION

a. Fifty-two thermocouples were located on the Launch Control Console as tabulated on Figure 3.3.4.2-1 and indicated by the sketches seen in Test Report 3.3.4.1, Temperature of Launch Control Console components, Figures 3.3.4.1-1 through 3.3.4.1-7.

TEST DESCRIPTION

b. Readings of thermocouples were recorded after steady state temperature conditions were reached with the DC input voltage at 30 VDC, and the Launch Control Console in an environment where the temperature ambient is the Launch Control Facility worst c[illegible] of 78°F, for the following operational mode of the Launch Control Console.

Ten status indicators illuminated for Launchers 5 and 6 and five status indicators illuminated for Launchers 1, 2, 3, 4, 7, 8, 9, and 10 and Alarms No. 1 and 2 activated.

SUMMARY OF TEST RESULTS

a. Although the component temperature did not exceed the limitations of Minuteman Electronic parts, the following was noted:

1. Alarm and Monitor Panel 25-24176, Card A2, Resistor R7 and R8 have temperatures exceeding the ma imum allowable temperature of 150°F for epoxy, and hence should not be encapsulated.

2. Alarm and Monitor Panel 25-24176, Card A2, R8, a ten-watt resistor is mounted too close to the dissipated by R8 is affecting the temperature of R7; therefore, a heat sink should be required for R8, and R8 should be relocated away from R7.

3. DC Power Filter 25-24179; the four diodes are operating near, and in one case, at the recommended maximum temperature of 47.5°C at the junction of the diode. The absolute maximum temperature of the junction according to Book 30 is 77.5°C.

b. The temperature change between code dissipate light on and code dissipate light off is as follows:

Alarm and Monitor Panel 25-24176	
R7	122°F
R8	125°F

There is a large temperature rise when the code dissipate light is turned off (this is shown on Figure 3.3.4.2-1). This is the normal condition when the Launch Control Panel is installed into the Launch Control Console.

c. The data obtained for the temperature analysis of the Launch Control Console is seen on Figure 3.3.4.2-1.

GENERAL INFORMATION

Test Engineer T. G. McCarthy Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 5-1-2

Date Test Completed 5-7-2

Location Bldg 9.20; Bay E-9; DC

FIGURE 3.3.4.2-1 WORSE CASE TEMPERATURE (°F) OF LCC COMPONENTS.

TEST STATUS INDICATORS ILLUMINATED FOR LAUNCHERS 5 & 6 AND FIVE STATUS INDICATORS ILLUMINATED FOR ALL OTHER LAUNCHERS. ALARM # 1 & 2 ACTUATED.

Component	Temperature (°F)
AMBIENT TEMPERATURE	78
POWER RESISTOR 29-19870 — HEAT SINK	106
POWER RESISTOR 29-19870 — RESISTOR BODY NEXT TO HEAT SINK	154
POWER RESISTOR 29-19870 — RESISTOR BODY ON TOP	158
POWER RESISTOR 29-19870 — STUD OUTBOARD	160
POWER RESISTOR 29-19870 — STUD INBOARD	164
POWER RESISTOR 29-19870 — SHIELD ABOVE RESISTOR	117
ALARM MONITOR 25-24176 — CODE DISSIPATE OFF — R7(A)	223
ALARM MONITOR 25-24176 — CODE DISSIPATE OFF — R8(A)	235
ALARM MONITOR 25-24176 — CODE DISSIPATE ON — R7(A)	101
ALARM MONITOR 25-24176 — CODE DISSIPATE ON — R8(A)	110
DIODE CR1(A2)	112

ALARM DRIVER A

Component	Temperature (°F)
AMBIENT TEMPERATURE	78
DIODE CR1	99
DIODE CR2	99
DIODE CR3	98
DIODE CR4	99
BRACKET CR1	96
BRACKET CR2	96
BRACKET CR3	96
BRACKET CR4	95
TRANSISTOR Q1	89
TRANSISTOR Q2	88
Q1 HEAT SINK	89
Q2 HEAT SINK	88

74

POWER RESISTOR :9-19870					ALARM MONITOR 25-24176				DC FILTER ASSEMBLY 25-24179									
					CODE DISSIPATE OFF		CODE DISSIPATE ON											
RESISTOR BODY NEXT TO HEAT SINK	RESISTOR BODY ON TOP	STUD OUT BOARD	STUD IN BOARD	SHIELD ABOVE RESISTOR	R7(A)	R8(A)	R7(A)	R8(A)	DIODE CR1 (A3)	DIODE CR2 (A3)	DIODE CR3 (A3)	DIODE CR4 (A4)	HEAT SINK CR1	HEAT SINK CR2	HEAT SINK CR3	HEAT SINK CR4	CAPACITOR C2	CAPACITOR C?
54	158	160	164	117	223	235	101	110	112	104	109	112	100	106	110	110	100	98

2

ALARM DRIVER ASSEMBLY 25-24180

CR3	DIODE CR4	BRACKET CR1	BRACKET CR2	BRACKET CR3	BRACKET CR4	TRANSISTOR Q1	TRANSISTOR Q2	Q1 HEAT SINK	Q2 HEAT SINK	TRANSISTOR Q1 (A1)	TRANSISTOR Q2 (A1)	TOP CENTER R2 (A1)	R2 HEAT SINK (A1)	TOP CENTER R10 (A1)	R10 HEAT SINK (A1)	TOP CENTER R13 (A1)	R13 HEAT SINK (A1)	TRANSISTOR Q1 (A2)
98	99	96	96	96	95	89	88	89	88	96	99	97	99	112	124	196	150	95

DC FILTER ASSEMBLY 25-24179

DIODE CR1 (A3)	DIODE CR2 (A3)	DIODE CR3 (A3)	DIODE CR4 (A4)	HEAT SINK CR1	HEAT SINK CR2	HEAT SINK CR3	HEAT SINK CR4	CAPACITOR C2	CAPACITOR C3
12	104	109	112	100	106	110	110	100	98

AUDIBLE ALARM ASSEMBLY 25-24181

TOP CENTER R1 (A1)	STRUCTURE NEXT TO R1	TOP CENTER R2 (A1)	BELL COIL	BUZZER COIL			
130	120	122	124	124			

ASSEMBLY 25-24180

HEAT SINK	TRANSISTOR Q1 (A1)	TRANSISTOR Q2 (A1)	TOP CENTER R2 (A1)	R2 HEAT SINK (A1)	TOP CENTER R10 (A1)	R10 HEAT SINK (A1)	TOP CENTER R13 (A1)	R13 HEAT SINK (A1)	TRANSISTOR Q1 (A2)	TRANSISTOR Q2 (A2)	TOP CENTER R2 (A2)	R2 HEAT SINK (A2)	TOP CENTER R10 (A2)	R10 HEAT SINK (A2)	TOP CENTER R13 (A2)	R13 HEAT SINK (A2)	TOP OF DISPLAY MODULE (LE 5 (G) 25-24178
8	96	99	97	99	112	124	196	150	95	98	96	97	114	122	191	180	120

TEST REPORT 3.3.4.3

TITLE

Off Design Temperature Test of Launch Control Console Components

OBJECTIVE

To determine the limits of the parameters affecting the temperature of Launch Control Console Components

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 3.3.5.1

TITLE

Launch Control Console D. C. Power Consumption

OBJECTIVE

To determine the DC power requirements of the Launch Control Console for various modes of operation.

CONCLUSIONS:

a. The test objective was realized

b. The LCC met the requirements of the Model Specification D2-5450

c. The results of the test are directly applicable to the BC-1 LCC, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, S/N 0002, 25-24172-7

DC Ammeter, 15 ampere range

DC Voltmeter, John Fluke 801, 50 volt range

DC Power Supply, Invar TP-15

Adapter - DC Power

TEST DESCRIPTION

a. Steady state input voltage and current measured, with input voltage from 27.5 to 30 VDC every 0.5 volt, for the following operating conditions:

1. No Status Indicators illuminated
2. Ten Status Indicators illuminated
3. Twenty Status Indicators illuminated
4. Thirty Status Indicators illuminated
5. Forty Status Indicators illuminated
6. Fifty Status Indicators illuminated
7. Sixty Status Indicators illuminated

b. TEST SETUP (See figure 3.3.5.1-1)

SUMMARY OF TEST RESULTS

a. The DC power consumption was within the 300 watts specified in the Model Specification D2-5450

b. Table of results:

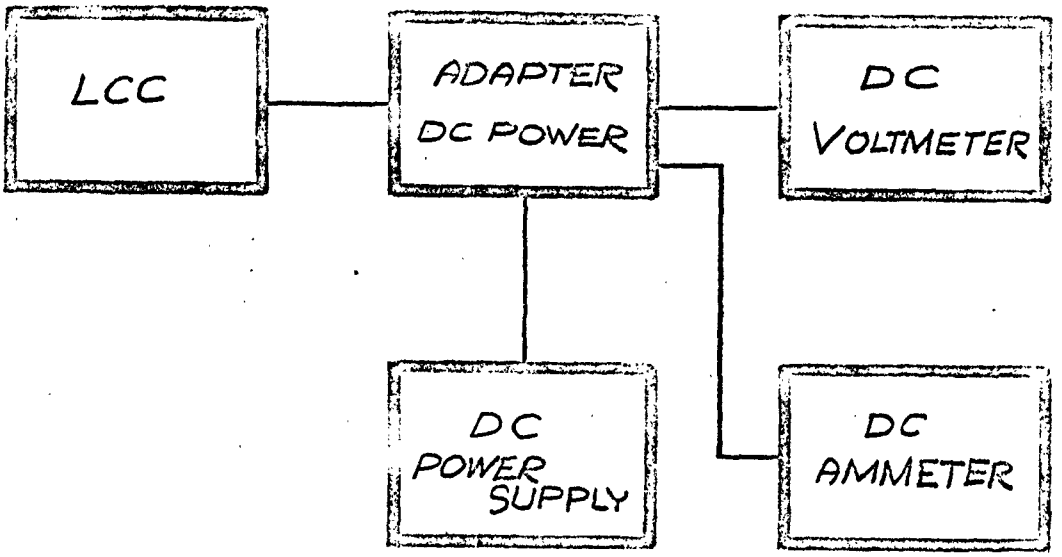
	Status Indicators Illuminated						
	0	10	20	30	40	50	60
Input Voltage (Volts)	27.5	27.5	27.5	27.5	27.5	27.5	27.5
Current (Amps)	2.85	3.60	4.30	5.10	5.83	6.55	7.33
Power (Watts)	78.4	99	118	140	160	180	202
Input Voltage (Volts)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Current (Amps)	2.90	3.70	4.40	5.20	5.90	6.65	7.40
Power (Watts)	81.2	104	123	146	165	186	207
Input Voltage (Volts)	28.5	28.5	28.5	28.5	28.5	28.5	28.5
Current (Amps)	3.00	3.75	4.45	5.25	6.00	6.75	7.52
Power (Watts)	85.5	107	127	150	171	192	214
Input Voltage (Volts)	29.0	29.0	29.0	29.0	29.0	29.0	29.0
Current (Amps)	3.05	3.80	4.55	5.35	6.10	6.85	7.65
Power (Watts)	88.5	110	132	155	177	199	222
Input Voltage (Volts)	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Current (Amps)	3.10	3.90	4.60	5.45	6.20	6.95	7.75
Power (Watts)	91.5	115	136	161	183	205	229
Input Voltage (Volts)	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Current (Amps)	3.15	3.95	4.70	5.50	6.25	7.05	7.85
Power (Watts)	94.5	119	141	165	188	212	236

c. The detailed results obtained are shown on the curves on figure 3.3.5.1-2

GENERAL INFORMATION

Test Engineer T. G. McCarthy Org 2-6524-4

Charge to EWR Number 3007
Date Test Started 5-10-2
Date Test Completed 5-10-2
Location Bldg. 9.120 Bay E9, DC



CALC			REVISED	DATE
CHECK				
APPD				
APPD				

FIGURE 3.3.5.1-1
DC POWER CONSUMPTION
SET UP

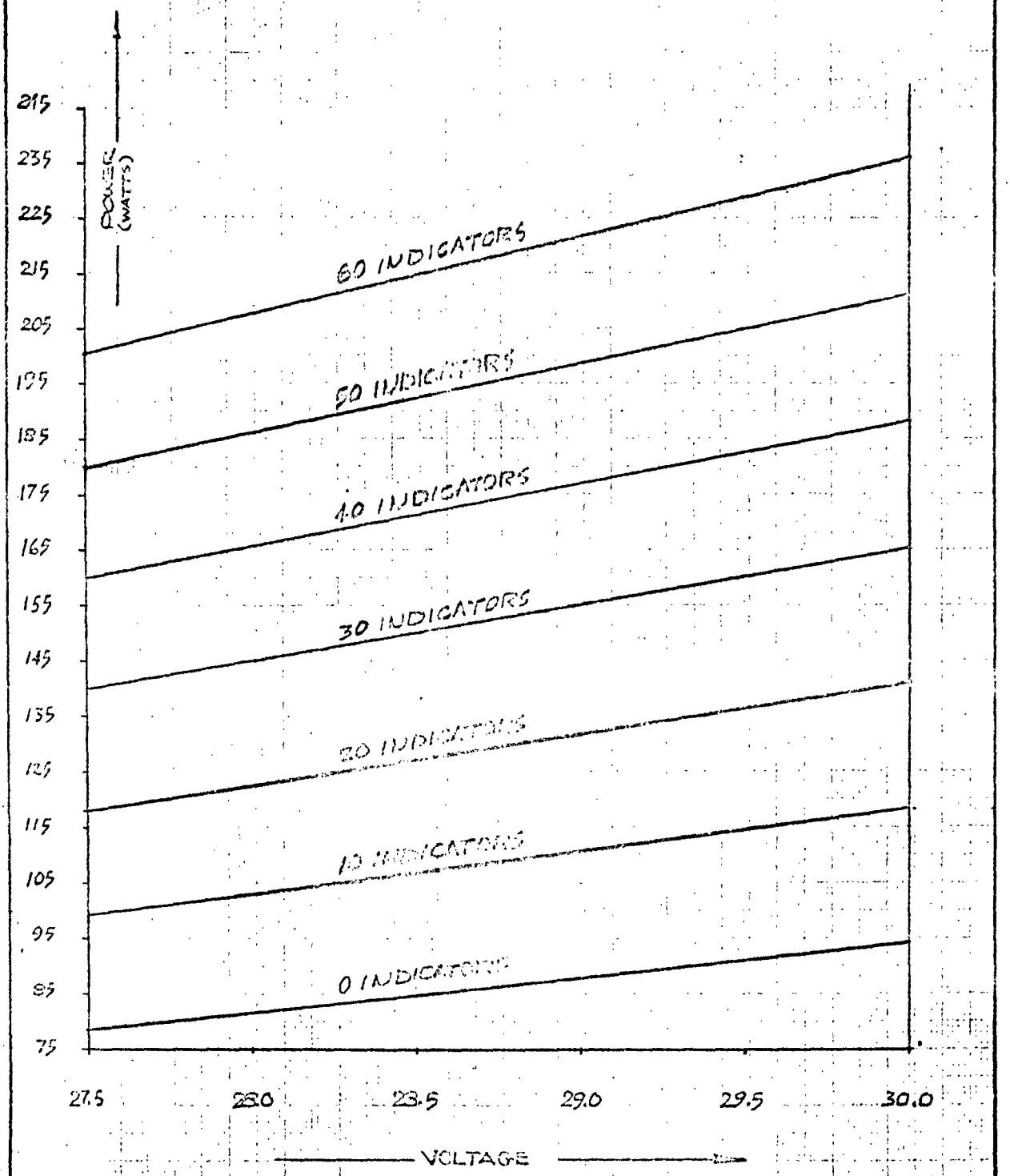
THE BOEING COMPANY

T2-2564
~~Vol. 3~~
Sec. 3

PAGE 20

03

U3 4036 3000 SBQ 10388



CALC			REVISED	DATE
CHECK				
APR				
APR				

FIGURE 3.3.5.1-2
LCC DC POWER CONSUMPTION

THE BOEING COMPANY

T2-2564
Vol. 3
Sec. 3
PAGE 21

U3 4013 8000

K-E ALBANENE 1951 60629

TEST REPORT 3.3.5.2

TITLE

Worst Case Launch Control Console DC Power Consumption

OBJECTIVE

To determine the maximum DC input power requirements of the Launch Control Console

CONCLUSIONS

a. The test objective was realized.

b. The LCC met the requirements of the Model Specification D2-5450.

c. The results of the test are directly applicable to the BC-1 LCC, since there is no change in this portion of circuitry.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, S/N 0002, 25-24172-7

DC Ammeter, 15 ampere range

DC Voltmeter, John Fluke 801, 50 volt range

DC Power Supply, Invar TP-15

Adapter - DC power

TEST DESCRIPTION

a. The steady state DC input voltage and current was measured with an input voltage of 30 VDC with a total of sixty status indicators illuminated and with both audible alarms activated.

b. Test Setup
See Test Report 3.3.5.1 LCC DC Power Consumption, Figure 3.3.5.1-1

SUMMARY OF TEST RESULTS

a. The worst case DC power consumption was within the 300 watts specified in the Model Specification D2-5450.

SUMMARY OF TEST RESULTS (Continued)

b. Results

Input voltage	30.0 volts
Current	8.85 amps
Power	266 watts
Indicators	60 illuminated with alarms 1 and 2 activated

GENERAL INFORMATION

Test Engineer T. G. McCarthy Org. 2-6524-4

Charge to EWA Number 3007
Date Test Started 5-11-2
Date Test Completed 5-11-2
Location Bldg 9-120, Bay E9, DC

TEST REPORT 3.3.6.1

TITLE

Audible Alarm Sound Level Evaluation

OBJECTIVE

To determine the operational characteristics of the Audible Alarm devices of the Launch Control Console.

CONCLUSIONS:

(a) The test objective was realized.

(b) The Audible Alarms met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, 0004, 25-24172-14

Oscilloscope, Tektronix 545 with camera

AC Voltmeter, Weston 433

Sound Level Meter, General Radio 1551A

Power Amplifier, Mc Intosh A 109

Signal Generator, Precision E 310

Frequency Meter, Hewlett - Packard 500B

DC Power Supply, Invar TP-15

TEST DESCRIPTION

The following were recorded:

a. Sound level versus AC input voltage variation for bell and buzzer, from 108 to 132 VAC at 2 volt intervals with input frequency at 60 cps.

b. Sound level versus AC input frequency variation for bell and buzzer, from 54 to 62 cps at 2 cps intervals with input voltage at 120V.

c. Sound level versus AC input voltage, for simultaneous operation of bell and buzzer with variation from 108 to 132 VAC at 2 volt intervals with frequency at 60 cps.

Test Description (continued)

d. Sound level versus AC input frequency variation, for simultaneous operation of bell and buzzer, from 54 to 62 cps at 2 cycle intervals with input voltage at 120V.

e. Sound level measuring instrument was placed 1 foot above the front center edge of the writing surface for (a) through (d).

f. Discernibility of bell and buzzer with the noise ambient, both individually and simultaneously at a distance of 35 feet from the Launch Control Console, with an input of 120 VAC at 60 cps.

g. Lab noise ambient for (e) above.

h. Test set-up, see Figure 3.3.6.1-1

SUMMARY OF TEST RESULTS

a. The sound levels, for the bell and buzzer, versus voltage variation at 60 cps are listed below.

VOLTAGE AC	108	110	112	114	116	118	120	122	124	126	128	130	132
BELL (db)	82	85	85	84	82	85	85	87	85	86	85	86	87
BUZZER (db)	80	81	82	80	79.5	79.0	80	80.5	81	81	82	83	82.5

b. The sound levels, for the bell and buzzer, versus frequency variation at 120 VAC are listed below:

CYCLES PER SECOND	54	56	58	60	62
BELL (db)	87	84	84	86	85
BUZZER (db)	80	81	81	80	81

c. The sound levels, for simultaneous operation of the bell and buzzer, versus voltage variation at 60 cps are listed below:

VOLTAGE AC	108	110	112	114	116	118	120	122	124	126	128	130	132
BELL AND BUZZER (db)	87	86	83	82	84	87	83	85	86	85	86	87	87

d. The sound level, for simultaneous operation of the bell and buzzer, versus frequency variation at 120 VAC are listed below.

CYCLES PER SECOND	54	56	58	60	62
BELL AND BUZZER (db)	84	85	85	83	84

SUMMARY OF TEST RESULTS (continued)

e. The bell and buzzer both individually and simultaneously can be heard at a distance greater than 35 feet with 120 VAC, 60 cps, applied and with a noise ambient of 74 decibels.

GENERAL INFORMATION

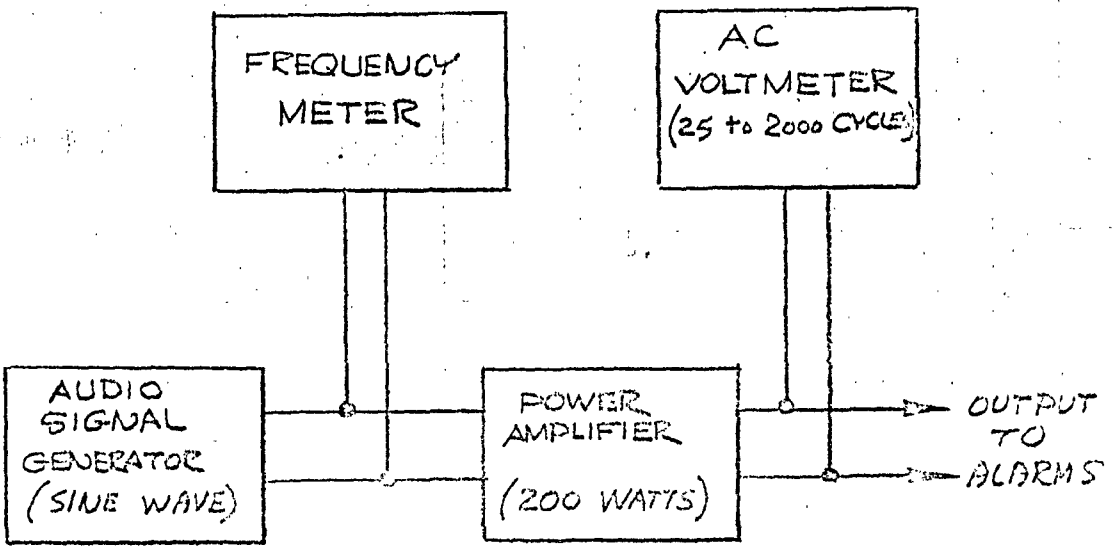
Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-23-62

Date Test Completed 7-26-62

Location: Bldg. 9-120; Bay E-9; Plant DC



CALC			REVISED	DATE	FIGURE 3.3.6.1-1 VARIABLE AC POWER SUPPLY
CHECK			A	11/27/2	
APR					
APR					THE BOEING COMPANY

T2-2564 Vol. 3
Sec. 3
PAGE 240

TEST REPORT 3.3.6.2

TITLE

Worst Case Audible Alarm Sound Level Evaluation

OBJECTIVE

To determine the effectiveness of the audible alarm devices under operational conditions.

CONCLUSIONS

(a) The test objective was realized.

(b) The Audible Alarms met the requirements of the Model Specification, D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0004, 25-24172-14

Oscilloscope, Tektronix 545 with camera

AC Voltmeter, Weston 433

Sound Level Meter, General Radio 1551 A

Power Amplifier, McIntosh A 109

Signal Generator, Precision E 310

Frequency Meter, Hewlett - Packard 500B

DC Power Supply, Invar TP-15

TEST DESCRIPTION

a. Sound level was recorded for the bell and buzzer activated individually and simultaneously with an input voltage of 108 VAC at 62 cps with a noise ambient of 80 decibels.

b. Sound level measuring instrument was placed 1 foot above the front center edge of the writing surface .

c. Discernibility of the bell and buzzer, individually and simultaneously was recorded at a distance of 35 feet from the Launch Control Console with the noise ambient.

d. Test set-up, see Figure 3.3.6.2-1

SUMMARY OF TEST RESULTS

a. Sound level for varying voltage is listed below.

Bell - 85 db Buzzer - 83 db Both - 85 db

b. The bell and buzzer were discernible with a noise ambient of 74 db both individually and simultaneously at a distance of 35 feet from the Launch Control Console

GENERAL INFORMATION

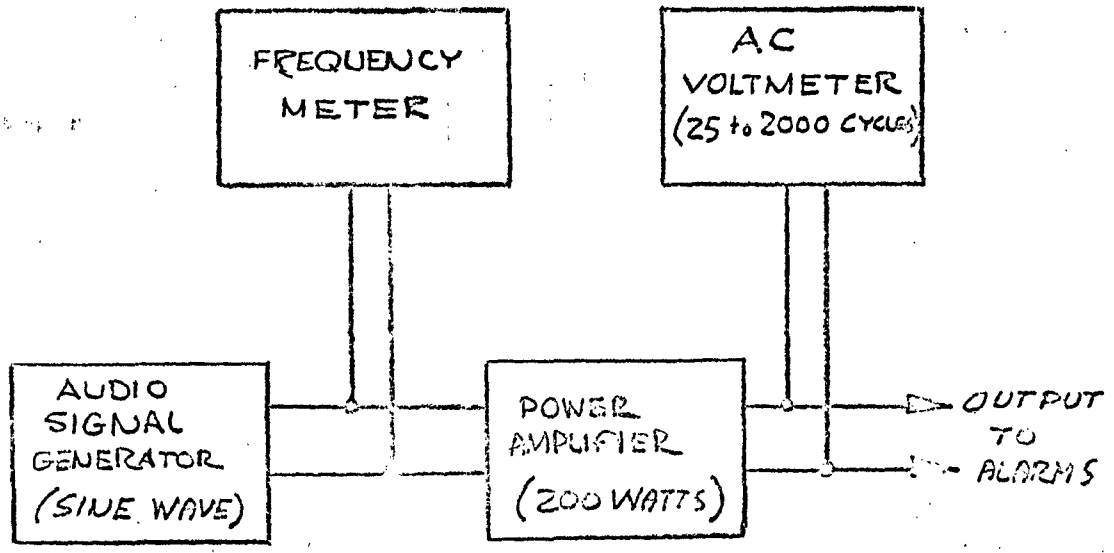
Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-23-62

Date Test Completed 7-26-62

Location: Bldg. 9-120; Bay E-9 ; Plant DC



CALC			REVISED	DATE	FIGURE 3.3.6.2-1 VARIABLE AC POWER SUPPLY	T2-2564 Vol. 3
CHECK			A	11/27/		Sec. 3
APR						
APR					THE BOEING COMPANY	PAGE 25b

TEST REPORT 3.3.6.3

TITLE

Off Design Audible Alarm Sound Level Test

CONCLUSIONS:

(a) The test objective was realized.

(b) The results of this test are directly applicable to the BC-1 Launch Control Console since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 545 with camera

AC voltmeter, Weston 433

Sound Level Meter, General Radio 1551A

Power Amplifier, Mc Intosh A-109

AC Power Supply, see Figure 3.3.6.3-1

Frequency meter, Hewlett - Packard 500B

DC Power Supply, Invar TP-15

Signal Generator, Precision E 310

TEST Description

a. Sound level was measured for bell and buzzer varying AC input voltage and frequency simultaneously at 2 volt and 2 cps steps from 120 VAC and 60 cps in both directions until the alarms ceased to operate. Sound level measuring instrument was placed 1 foot above the front center edge of the writing surface.

b. Test set-up, see Figure 3.3.6.3-1

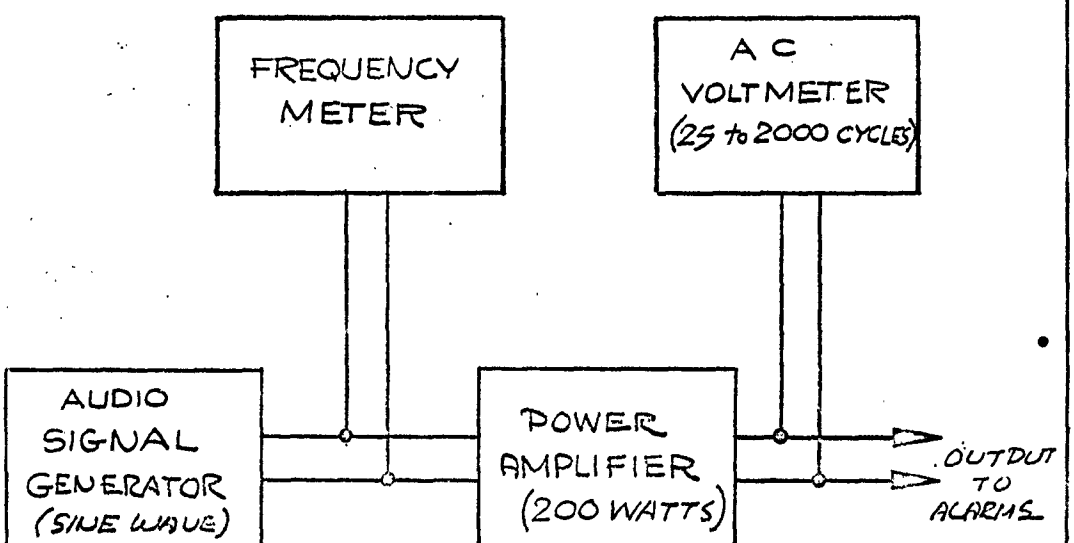
SUMMARY OF TEST RESULTS

a. The sound level readings are listed in Table 3.3.6.3-2 for corresponding voltage and frequency.

b. The alarms operated from 80 VAC and 20 cycles/second to 158 VAC and 98 cycles/second and were considered ineffective outside of this range with a noise ambient of 74 decibels.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4
Charge to EWA No. 3007
Date Test Started 7-23-62
Date Test Completed 7-26-62
Location: Bldg. 9-120; Bay, E-9; Plant DC



CALC			REVISED	DATE	FIGURE 3.3.6.3-1 AC POWER SUPPLY USED	T2-2564 Vol. 3
CHECK			A	11/27/72		Sec. 3
APPD					BOEING AIRPLANE COMPANY	PAGE 26a
APPD						

SUMMARY OF TEST RESULTS (continued)

TABLES 3.3.6.3-2

VOLTS	CYCLES PER SECOND	BELL (db)	BUZZER (db	BOTH (db)
120	60	78	85	85
122	62	79	83	83.5
124	64	79	84.5	85
126	66	78	82	83
128	68	77	84	84.5
130	70	77	86	86.25
132	72	78	87	87.5
134	74	78	88	89
136	76	77	85	85
138	78	78	83	83.5
140	80	77	80	81
142	82	less than 75	79	79.5
144	84	↓	80	80
146	86		79	79
148	88		79	79
150	90		79	79
152	92		79	79
154	94		79	79
156	96		80	80
158	98		78.5	78.5

VOLTS	CYCLES PER SECOND	BELL (db)	BUZZER (db)	BOTH (db)
118	58	81	82	84
116	56	84	80	86
114	54	83	82	84
112	52	82	84	86
110	50	81	81	84
108	48	83	82	85
106	46	82	82	85
104	44	81	83	84
102	42	81	82	84
100	40	82	82	84
98	38	80	81	82
96	36	80	82	84
94	34	80	81	82
92	32	79	81	81
90	30	78	81	82
88	28	83	82	84
86	26	81	82	84
84	24	80	81	83
82	22	81	80	81
80	20	79	81	82

TEST REPORT 3.3.6.4

TITLE

Audible Alarm Circuit Evaluation

OBJECTIVE

To determine the operational characteristics of the audible alarm circuitry of the Launch Control Console.

CONCLUSIONS

(a) The test objective was realized.

(b) The audible alarm circuits met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, 25-24172-14, Serial No. 0000001

Oscilloscope, Tektronix 541 with camera

Differential Voltmeter, Fluke 803

DC Milliammeter, Hewlett - Packard 428A

DC Power Supply, Trygon, M36-5

TEST DESCRIPTION

a. The follcwing measurements were made on the alarm driver assembly:

1. Leakage current of Q1 and Q2 was measured in the OFF condition under input voltages from 27.5 to 30 VDC every 0.5 volts.

2. Base reverse bias was measured for Q1 and Q2 under input voltage from 27.5 to 30 VDC every 0.5 volts.

3. Base forward drive to Q1 and Q2 was measured under input voltage from 27.5 to 30 VDC every 0.5 volts.

4. Emitter and collector voltages of transistors Q1 and Q2 in both the ON and OFF conditions were measured with input voltages from 27.5 to 30 VDC every 0.5 volts.

b. Turn ON and OFF time of the Alarm Driver PCA (25-255391-1,-2) was measured for the bell and buzzer under input voltage from 27.5 to 30 VDC every 0.5 volts.

TEST DESCRIPTION (continued)

c. Emitter, collector, and base voltages of Q1 and Q2 were measured on the Alarm Driver in both the ON and OFF conditions under input voltages of 27.5 to 30 VDC.

d. Effect of the alarm test and alarm reset switch bounce on the alarm circuitry was measured at the input voltages of 27.5 and 30 VDC.

e. Transients between relay contacts and relay case were measured under input voltages of 27.5 to 30 VDC and 108 to 132 VAC.

f. Interaction between audible alarm circuits was recorded.

SUMMARY OF TEST RESULTS

a. Results of Test (a) of the Test Description are listed in Figure 3.3.6.4-1.

b. Turn ON time for both cards at all voltages was 40 microseconds. Turn OFF time for both cards at all voltages was 4 milliseconds. This was measured at Terminal E1 on both cards.

c. Data on emitter, collector and base voltages is recorded in Figure 3.3.6.4-2.

d. Alarm Test and Alarm Reset switch bounce is shown in Figure 3.3.6.4-3.

e. Transients between relay contacts and case are shown in Figure 3.3.6.4-4.

f. Interaction between alarm circuits is shown in Figure 3.3.6.4-5.

g. All transistor voltages and currents were within design limits.

h. Variation of input voltage had no effect on turn ON and turn OFF times.

i. Switch bounce time was consistent with the switch design and had no effect on the operation of the alarm circuits.

j. Transients between relay contacts and case were intermittent and varied with the instantaneous AC voltage on the contacts. The sketches are representative of the transients most commonly encountered.

k. Interaction between alarm circuits is negligible and does not interfere with the operation of either alarm.

ALARM DRIVER ASSEMBLY

1. Leakage Current (Emitter Current - Off Condition)

Input Volts	Q1	Q2
27.5	.01 Milliamps	.01 Milliamps
28	.01 "	.01 "
28.5	.01 "	.01 "
29	.01 "	.01 "
29.5	.01 "	.01 "
30	.01 "	.01 "

2. Base Reverse Bias (Emitter to Base - Off Condition)

Input Volts	Q1	Q2
27.5	.782 Volts	.750 Volts
28	.781 "	.751 "
28.5	.778 "	.748 "
29	.778 "	.752 "
29.5	.778 "	.752 "
30	.775 "	.752 "

3. Base Forward Drive (Emitter Current - On Condition)

Input Volts	Q1	Q2
28.5	362 Milliamps	370 Milliamps
28	378 "	378 "
28.5	381 "	381 "
29	395 "	385 "
29.5	400 "	398 "
30	408 "	405 "

4. Emitter and Collector Voltages (with respect to Common)

Input Volts	Emitter (volts) Q1 On	Emitter (volts) Q1 Off	Collector (volts) Q1 On	Collector (volts) Q1 Off
27.5	23.75	24.206	23.722	.002
28	24.323	24.755	24.306	.007
28.5	24.728	25.172	24.705	.007
29	25.312	25.755	25.286	.008
29.5	25.723	26.167	25.701	.008
30	26.341	26.779	26.317	.008

Input Volts	Emitter (volts) Q2 On	Emitter (volts) Q2 Off	Collector (volts) Q2 On	Collector (volts) Q2 Off
27.5	23.758	24.20	23.735	.007
28	24.332	24.756	24.308	.007
28.5	24.732	25.168	24.710	.007
29	25.315	25.753	25.287	.008
29.5	25.727	26.164	25.704	.008
30	26.346	26.782	26.325	.008

Figure 3.3.6.4-1

Emitter, Collector and Base Voltages (25-25539-6 A1, Q1 and Q2)

Card A1 Transistor Q1

Input Volts	Emitter		Base		Collector	
	ON	OFF	ON	OFF	ON	OFF
27.5	23.437	24.953	22.405	25.517	23.065	16.380
28	24.077	25.622	23.073	26.179	23.749	16.833
28.5	24.405	25.045	23.390	26.503	24.072	17.055
29	24.995	26.522	23.968	27.081	24.642	17.446
29.5	25.305	26.843	24.292	27.399	24.964	17.664
30	25.800	27.340	24.775	27.881	25.451	17.995

Card A1 Transistor Q2

27.5	21.823	17.397	22.787	16.384	22.074	25.509
28	22.461	17.872	23.441	16.830	22.721	26.167
28.5	22.772	18.108	23.755	17.052	23.036	26.492
29	23.327	18.522	24.311	17.443	23.591	27.068
29.5	23.642	18.757	24.627	17.663	23.909	27.392
30	24.117	19.108	25.106	17.995	24.389	27.879

Card A2 Transistor Q1

27.5	23.451	24.925	22.429	25.52	23.155	16.387
28	24.087	25.592	23.069	26.181	23.797	16.835
28.5	24.411	25.917	23.388	26.504	24.119	17.057
29	24.998	26.592	23.962	27.080	24.686	17.448
29.5	25.312	26.811	24.285	27.401	25.012	17.667
30	25.807	27.308	24.769	27.885	25.497	17.998

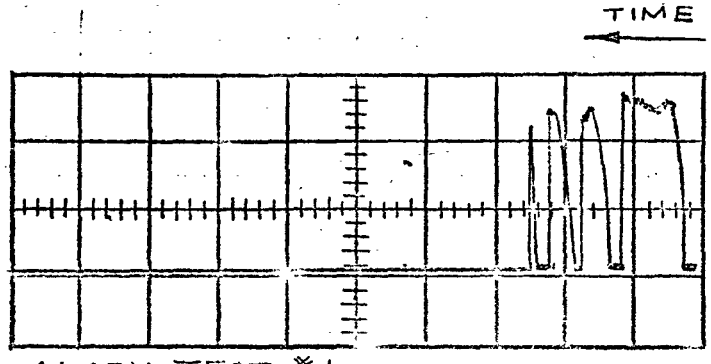
Card A2 Transistor Q2

27.5	21.829	17.403	22.847	16.387	22.076	25.509
28	22.455	17.879	23.484	16.834	22.712	26.168
28.5	22.767	18.115	23.799	17.055	23.027	26.493
29	23.319	18.529	24.355	17.445	23.580	27.067
29.5	23.632	18.763	24.672	17.667	23.909	27.395
30	24.107	19.116	25.155	17.997	24.379	27.881

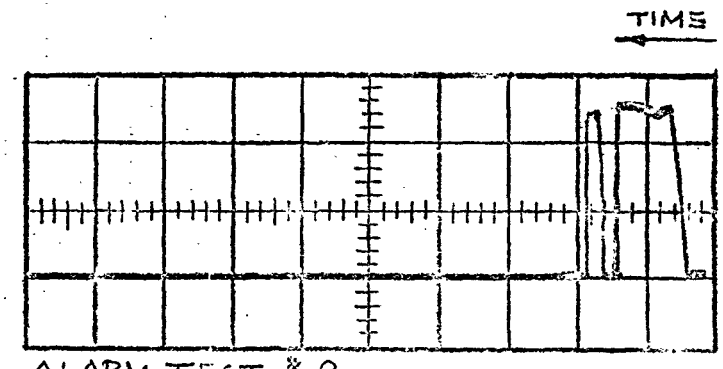
Figure 3.3.6.4-2

19

ALARM TEST

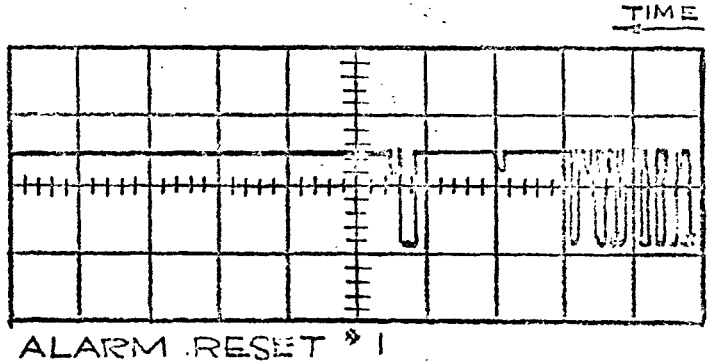


ALARM TEST # 1
VERT.: 10 V/CM
HORZ.: 0.1 mil SEC/CM

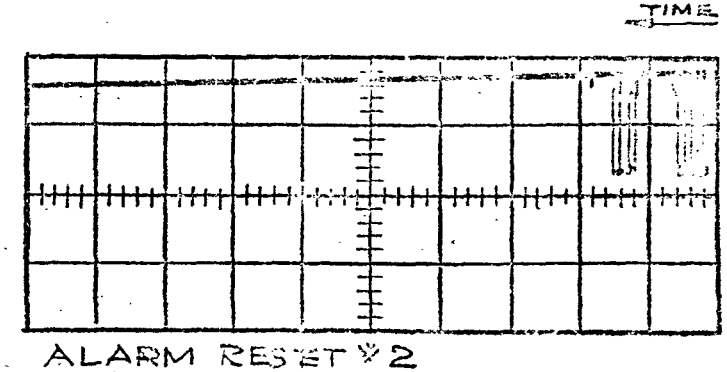


ALARM TEST # 2
VERT.: 10 V/CM
HORZ.: 1.0 mil SEC/CM

ALARM RESET



ALARM RESET # 1
VERT.: 1.0 V/CM
HORZ.: 0.5 mil SEC/CM



ALARM RESET # 2
VERT.: 1.0 V/CM
HORZ.: 2.0 mil SEC/CM

FIG 3.3.6.4-3
SWITCH BOUNCE

CALC	CHECK	APR	APR	REVISED	DATE
				A	11/27/

THE BOEING COMPANY

T2-2564 Vol. 3 | Sec. 3 | PAGE 27d

U.S. ALBANENE 1984 69281

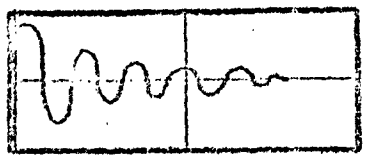
US 4013 8000

1 MEG INPUT TO SCOPE

BELL

TIME → TURN ON

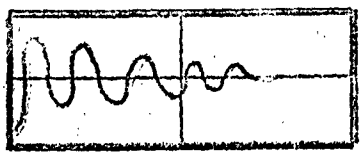
20 VCM



K2A1 TO CASE

HORZ: 50 μ SEC/CM

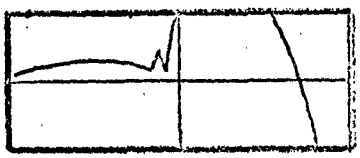
20 VCM



K2B1 TO CASE

HORZ: 50 μ SEC/CM

20 VCM



K2A2 TO CASE

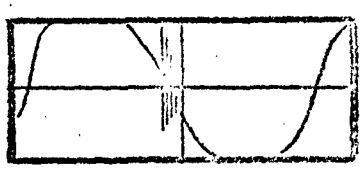
HORZ: 2 mil SEC/CM

20 VCM

K2B2 TO CASE

HORZ: 2 mil SEC/CM

50 VCM



K2A2 TO CASE

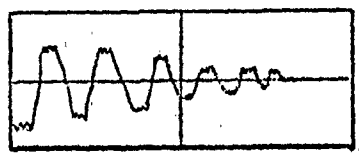
HORZ: 2 mil SEC/CM

BUZZER

TIME → TURN ON

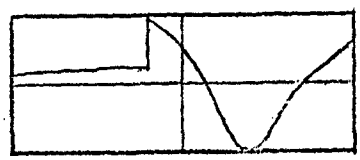
K1A1 TO CASE

HORZ: 5 μ SEC/CM



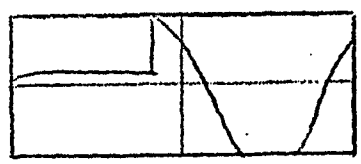
K1B1 TO CASE

HORZ: 50 μ SEC/CM



K1A2 TO CASE

HORZ: 2 mil SEC/CM



K1B2 TO CASE

HORZ: 2 mil SEC/CM

½ SCALE

CALC			REVISED	DATE	FIG 3.3.6.4-4 RELAY TRANSIENTS
CHECK			A	11/27/	
APR					
APR					
					THE BOEING COMPANY

T2-2564 Vol. 3

Sec. 3

PAGE 27e

US 4013 8000

K-E ALBANENE 1991 69281

ALARM CIRCUIT INTERACTION

	ALARM No. 1		
	Emitter	Base	Collector
Alarm No. 2 Off	24.071 volts	24.842 volts	.008 volts
Alarm No. 2 On	23.80 volts	24.582 volts	.018 volts

Figure 3.3.6.4-5

GENERAL INFORMATION

Test Engineer M. E. Novak

Charge to EWA No. 3007

Date Test Started 8-20-62

Date Test Completed 8-29-62

Location; Bldg. 9-120; Bay, E-9; Plant DC

TEST REPORT 3.3.6.5

TITLE

Status Change Evaluation

OBJECTIVE:

To determine the characteristics of the alarm trigger resulting from a change of status.

CONCLUSIONS:

(a) The test objective was realized.

(b) The alarm circuits met the requirements of the Model Specification D2-5450

(c) The results of this test are directly applicable to the BC-1 Launch Control Console since there is no change in this portion of the circuit.

ITEMS IN TEST:

Launch Control Console, Figure "A" 1243 Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 545 with camera

DC Power Supply, Invar TP-15

DC Voltmeter Simpson 260

Adapter, Missile Status Indicator

Adapter, DC Power

Adapter, AC Power

TEST DESCRIPTION

a. Record of alarm turn ON for both bell and buzzer with a status change from 26 to 0 VDC in 5 ± 1 microsecond with a DC input voltage from 27.5 to 30 VDC at 0.5 volt intervals.

b. Repeat (a) above with a status change in 9 ± 1 microseconds.

c. Test Set up, see Figure 3.3.6.5-1.

SUMMARY OF TEST RESULTS:

The alarm trigger resulting from the change of status activated the alarms for all conditions of this test.

GENERAL INFORMATION

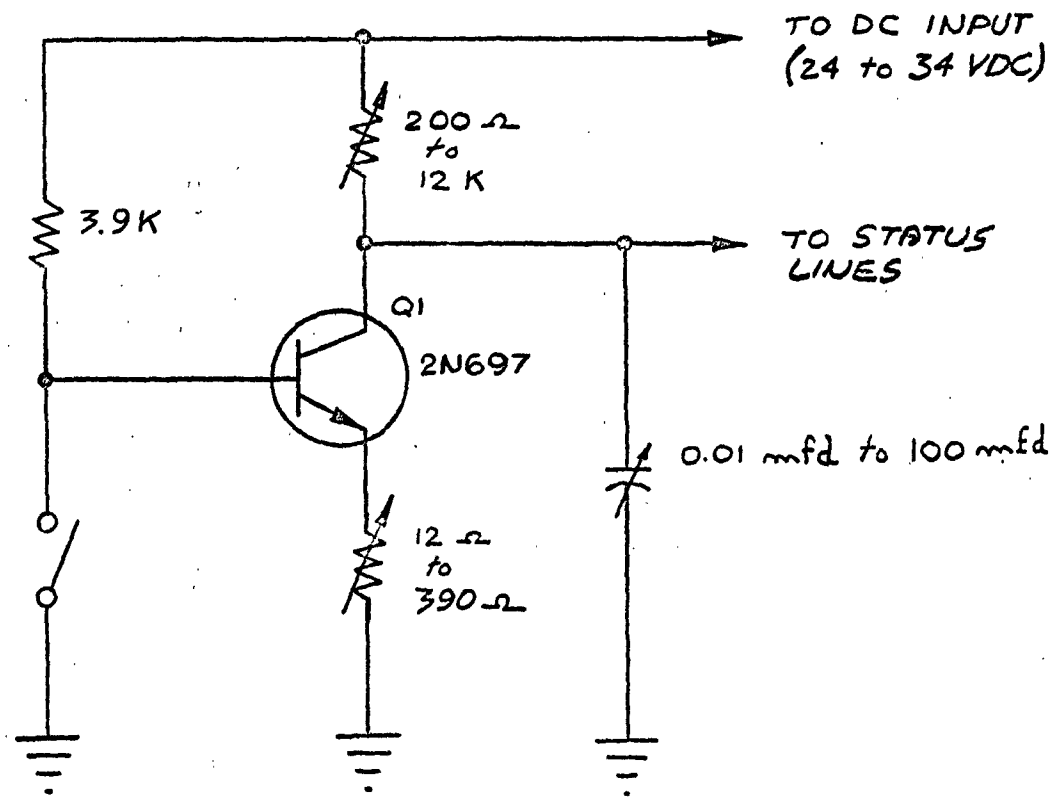
Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-21-62

Date Test Completed 7-23-62

Location: Bldg 9-120; Bay E-9; Plant DC



CALC			REVISED	DATE	FIGURE 3.3.6.5-1 ALARM TRIGGERING TEST CIRCUIT
CHECK			A	11/27/2	
APPD					
APPD					
					THE BOEING COMPANY

T2-2564
Vol. 3
Sec. 3
PAGE 28b

U3 4036 3000 REQ 10388

TEST REPORT 3.3.6.6

TITLE

Worst Case Status Change Evaluation

OBJECTIVE

To determine the characteristics of the alarm trigger resulting from a change of status under worst case conditions.

CONCLUSIONS

(a) The test objective was realized.

(b) The alarm circuits met the requirements of the Model Specification D2-5450.

(c) The results of this test are directly applicable to the BC-1 Launch Control Console since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 545 with camera

DC Power Supply, Invar TP-15

DC Voltmeter, Simpson 260

Adapter, Missile Status Indicator

Adapter, DC Power

Adapter, AC Power

TEST DESCRIPTION

(a) Record of alarm turn "ON" under conditions of a status change from 24 to 4 VDC in 9 $\pm$ 1 microseconds on ten status lines each for the bell and buzzer with a DC input voltage of 27.5 volts applied to the console.

(b) Test Set Up, See Test Report 3.3.6.5, Figure 3.3.6.5-1.

SUMMARY OF TEST RESULTS

The alarm trigger resulting from the change of status activated all alarms satisfactorily for all conditions of this test.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-21-62

Date Test Completed 7-23- 62

Location: 9-120 Bldg; E-9; Plant, DC

TEST REPORT 3.3.6.7

TITLE

Off Design Status Change Test

OBJECTIVE:

To determine the limit to which the status change can deteriorate and still activate the audible alarm.

CONCLUSIONS:

(a) The test objective was realized

(b) The results of this test are directly applicable to the BC-1 Launch Control Console since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0002, 25-24-172-7

Oscilloscope, Tektronix 545 with camera

DC Power Supply, Invar TP-15

DC voltmeter, Simpson 260

Adapter - Missile Status indicator

Adapter - DC Power

Adapter - AC Power

TEST DESCRIPTION:

(a) With a 24 VDC input and a status change voltage of 20v in 9 ± microseconds, the status change voltage was reduced in 1-volt steps until the alarm ceased to activate.

(b) (a) above was repeated, increasing the rate of status change in 2 microsecond steps until the alarm ceased to activate.

(c) (a) and (b) above were repeated for a DC input of 24 to 34 VDC in 2 volt steps.

(d) Test Setup - See Test Report 3.3.6.5, Figure 3.3.6.5-1

SUMMARY OF TEST RESULTS

a. The alarm will not activate with a status change of 5 volts or less.

b. The alarm will not activate for a status change of 20 volts if the length of the pulse is 18 milliseconds or greater.

c. For input voltages as shown, the alarm will not activate for pulse width greater than that listed in the table below.

Input Voltage	24v	25v	26v	27v	28v	29v	30v	32v	33v	34v
Pulse width (milliseconds)	14	35	40	40	50	50	55	55	60	60

d. The alarms will not activate for pulse widths greater than those listed below for the corresponding input and status change voltages, all readings are in milliseconds.

Input Voltage				
26v	28v	30v	31v	Status Change Voltage
40	45	45	45	20v
70	60	60	60	18v
80	90	100	120	16v
100	120	130	130	14v
140	150	160	170	12v
140	140	140	150	10v

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-16-62

Date Test Completed 7-21-62

Location: Bldg: 9-120; Bay E-9; Plant DC

TEST REPORT 3.3.7.1-a

TITLE

Breakwire Encoder Test - Program Control Panel

OBJECTIVE

To determine the electrical and mechanical characteristics of the Breakwire Encoder (Program Control Panel)

CONCLUSIONS

(a) The test objective was realized.

(b) The Program Control Panel met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0000001, 25-24172-11

Program Control Panel, Part No. 25-24177-10, Serial No. 0000006

Differential Voltmeter, John Fluke 803

Test Adapter, Program Control

Oscilloscope, Tektronix 545

DC Power Supply

TEST DESCRIPTION

1. Order of switch activation was recorded.

2. Time between first and last bit switch actuation was recorded.

3. Voltage drop at the contacts of each switch was measured for:

   a. 1.5 Milliamperes - 6 volts DC
   b. 1 ampere - 30 volts DC

4. Contact voltage drop was measured after 500 actuations of a 10 per cent sample of switches at 1.5 milliamperes and 6 volts.

5. Switch contact bounce time was measured for a 10 per cent sample of switches.

SUMMARY OF TEST RESULTS

1. Switch actuation order for this panel was as follows: (Launcher Position 2)

   S1 and S13 in parallel, S17, S5, S8, S7, S19, S16, S20, S18, S6, S4 and S9 and S21 in parallel.

2. Time between first and last switch actuation was 100 milliseconds when the control is depressed from one extreme to the other in 160 milliseconds.

3. The voltage drop across the switch contacts with 1.5 milliamperes at 6 volts was too small to measure. No change was detectable after 500 actuations.

4. The voltage drop across the contacts with 1 ampere at 30 volts was as follows:

S8 - .0054 volts	S5 - .0050
S7 - .0054 "	S14 - .0053
S6 - .0054 "	S15 - .0054
S20 - .0053 "	S16 - .0049
S19 - .0137 "	S17 - .0062
S18 - .0062 "	S13 - .0193
S2 - .0056 "	S9 - .0190
S3 - .0055 "	S21 - .0044

5. The switch contact bounce time was 2.5 milliseconds for all switches measured during switch closure. No bounce was detectable during switch opening.

GENERAL INFORMATION

Test Engineers M. E. Novak

T. G. McCarthy

Charge to EWA No. 3007

Date Test Started 8-9-62

Date Test Completed 8-13-62

Location: Bldg. 9-120; Bay E-9; Plant DC

TEST REPORT 3.3.7.1-b

TITLE:

Breakwire Encoder Test (Launch Control Panel).

OBJECTIVE:

To determine the electrical and mechanical characteristics of the Breakwire Encoder. (Launch Control Panel)

CONCLUSIONS:

(a) The test objective was realized.

(b) The Launch Control Panel met the requirements of the Model Specification D2-5450.

ITEMS IN TEST:

Launch Control Console Figure "A" 1243, Part No. 25-24172-14, Serial No. 0000001

Launch Control Panel, 25-24178, Serial No. 0000008

Differential Voltmeter, John Fluke 803

Test Adapter, Launch Control

Oscilloscope, Tektronix 545, with camera

DC Power Supply, Invar TP-15

TEST DESCRIPTION:

1. Order of switch actuation was recorded.

2. Time between first and last switch actuation was measured.

3. Contact voltage drop was measured for operational and rated current and after 500 actuations.

4. Switch bounce time was measured.

SUMMARY OF TEST RESULTS:

a. Order of switch actuation for this panel is shown (1) for the inhibit switch and (2) for the Launch Switch.

(1) S71, S89, S66, S67, S82, S74, S68, S73,S92, S90, S76, S65, S81, S87, S69, S86, S88, S75, S79, S84, S78, S95, S83, S91, S70,S85 S72, S77, S94, S96, S80

SUMMARY OF TEST RESULTS (continued)

(2) S26, S19, S18, S22, S23, S17, S3, S24, S25, S21, S8, S4, S2, S56, S20, S9, S60, S52, S14, S1, S12, S10, S7, S39, S55, S11, S6, S33, S59, S54, S34, S16, S5, S41, S49, S15, S38, S45, S36, S35, S13, S57, S58, S42, S51, S40, S44, S37, S53, S50, S61, S43, S48, S46, S47.

b. Time between first and last switch actuation was 200 milliseconds when switch actuation was performed in 250 milliseconds.

c. Contact voltage drop is listed in Figure 3.3.7.1-b-1.

d. Switch bounce time for switches closing is as follows:

S5, 5 microseconds; S8, S69, and S9, 250 microseconds; S80, 3 microseconds; all reed switches, 5 microseconds; S97, S98, S100, and S101, 1.5 milliseconds. No bounce was detectable for the switches opening.

SWITCH CONTACT VOLTAGE DROP

Launch Control Panel 0000008

Switch		6 Volts at 1.5 Milliamps	6 Volts at 1.5 Milliamps After 500 Actuations	30 Volts at 1 amp
S1	S65	.001 Volts	.0004 Volts	.2333 Volts
S2	S66	.0009 "	.0005 "	.2370 "
S3	S67	.0006 "	.0003 "	.2470 "
S4	S68	.0007 "	.0005 "	.2270 "
S5	S69	.0005 "	.0006 "	.2374 "
S6	S70	.0005 "	.0006 "	.2424 "
S7		.0006 "	.0004 "	.1827 "
S8		.0006 "	.0004 "	.1914 "
S9		.0005 "	.0005 "	.1916 "
S10		.0005 "	.0004 "	.1881 "
S11		.0006 "	.0004 "	.1892 "
S12		.0005 "	.0005 "	.2006 "
S13		.0006 "	.0003 "	.1910 "
S14		.0003 "	.0005 "	.1975 "
S15		.0005 "	.0005 "	.1999 "
S16		.0004 "	.0006 "	.2065 "
S17		.0003 "	.0004 "	.1488 "
S18		.0003 "	.0003 "	.1500 "
S19		.0003 "	.0003 "	.1566 "
S20		.0002 "	.0002 "	.1659 "
S21		.0004 "	.0005 "	.1629 "
S22		.0002 "	.0005 "	.1531 "
S23		.0003 "	.0005 "	.1519 "
S24		.0002 "	.0006 "	.1736 "
S25		.0002 "	.0005 "	.1345 "
S26		.0003 "	.0006 "	.1658 "
S33	S71	.0006 "	.0007 "	.2228 "
S34	S72	.0007 "	.0006 "	.2099 "
S35	S73	.0008 "	.0007 "	.2460 "
S36	S74	.0006 "	.0007 "	.2530 "
S37	S75	.0009 "	.0008 "	.2700 "
S38	S76	.0006 "	.0007 "	.2390 "
S39	S77	.0006 "	.0007 "	.2800 "
S40	S78	.0006 "	.0008 "	.2750 "
S41	S79	.0006 "	.00097 "	.2660 "
S42	S80	.0004 "	.0007 "	.3200 "
S43	S81	.0004 "	.0009 "	.2640 "
S44	S82	.001 "	.0008 "	.2140 "
S45	S83	.0004 "	.0007 "	.2820 "

SWITCH CONTACT VOLTAGE DROP (continued)

Launch Control Panel 0000008

Switch		6 Volts at 1.5 Milliamps	6 Volts at 1.5 Milliamps After 500 Actuations	30 Volts at 1 amp
S46	S84	.0004	.0005	.2520
S47	S85	.0008	.0006	.2280
S48	S86	.0003	.0006	.2470
S49	S87	.0003	.0004	.1920
S50	S88	.0004	.0004	.1932
S51	S89	.0007	.0005	.2350
S52	S90	.0004	.0004	.2230
S53	S91	.0016	.0010	.2560
S54	S92	.0004	.0005	.2350
S55	S93	.0007	.0005	.2320
S56	S94	.0005	.0005/	.2060
S57	S95	.0009	.0006	.2430
S58	S96	.0005	.0005	.2270
S59		.0004	.0005	.1470
S60		.0004	.0005	.1504
S61		.0004	.0006	.1474
S104		.0004	.0006	.1324
S99	S102 S103	.0008	.0029	.3844
S97 "A"	S98 "K"	.0005	.0006	.1776
S100 "A"	S101 "K"	.0004	.0005	.1854

Figure 3.3.7.1-b-1

GENERAL INFORMATION:

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 8-27-62

Date Test Completed 9-5-62

Location; Bldg. 9-120; Bay E-9; Plant DC

TEST REPORT 3.3.8.1

TITLE

Launch Control Console DC Input Filter Test

OBJECTIVE

To determine the DC in-rush for the Launch Control Console at nominal input voltages under various operating modes.

CONCLUSIONS

a. The test objective was realized.

b. The filtering circuits of the Launch Control Console met the requirements of the Model Specification D2-5450.

c. The results of the test are directly applicable to the BC-1 Launch Control Console, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Serial No. 0002, 25-24173-7

Oscilloscope, Tektronix 535A with camera

DC Power Supply, Invar TP-15

DC Voltmeter, Simpson 260A

Adapter, DC Power

TEST DESCRIPTION

a. Observe wave shape across 0.1 ohm resistor placed in series with inductor L2 on Card A2 in the DC Filter Assembly with an input voltage from 27.5 to 30 VDC in 0.5 VDC steps under the following conditions;

   1. One Launch Facility Lamp Test
   2. Two Launch Facilities Lamp Test

b. Test set-up for (a) is seen on Figure 3.3.8.1-1

c. Observe wave shape across 0.1 ohm resistor in series with Inductor L2 shorted out on Card A2 in the DC Filter Assembly with an input voltage from 27.5 to 30.0 VDC measured every 0.5 volt under the following conditions:

   1. One Launch Facility Lamp Test
   2. Two Launch Facilities Lamp Test

TEST DESCRIPTION (Continued)

d. Test set-up for (c) is seen on Figure 3.3.8.1-2.

e. Remove the short across L2 and the 0.1 ohm resistor from the circuit.

f. Observe the wave shape across the DC Input Line with the input voltage from 27.5 to 30 VDC measured every 0.5 volt under the following conditions:

1. Ten Status indicators illuminated
2. Twenty status indicators illuminated
3. Thirty status indicators illuminated
4. Forty status indicators illuminated
5. Fifty status indicators illuminated
6. Sixty status indicators illuminated

g. Test set-up for (f) is seen on Figure 3.3.8.1-3

h. Repeat (f) above with a short across L1 in the DC Filter Assembly.

i. Test set-up is seen on Figure 3.3.8.1-4.

SUMMARY OF TEST RESULTS

a. The data obtained as shown in Figure 3.3.8.1-5 for one Launcher and Lamp Test switches pressed simultaneously is as follows:

1. With inductor L2 not shorted, the maximum voltage across the 0.1 ohm resistor is 1.0 volt peak for 0.038 micro-second. The transient condition has dampened from 1v peak to .1v peak in 0.8 micro-second.

2. With inductor L2 shorted, the maximum voltage across the 0.1 ohm resistor is 2.2 volts peak for 0.080 micro-second. The transient condition has dampened from 2.2v peak to .1v peak in 1.2 micro-seconds.

Varying the voltage from 27.5 to 30.0 VDC has little effect on the magnitude and duration of the transient condition. There is 1.2 volt peak and 0.042 micro-second difference for L2 not shorted and L2 shorted. The duration of the transient is 0.4 micro-second shorter for L2 not shorted than shorted. Inductor L2 is required in order to minimize the magnitude and duration of the transient condition caused by the activation of lamp testing.

SUMMARY OF TEST RESULTS (continued)

b. The data obtained as shown in Figure 3.3.8.1-5 for two launchers and lamp test switches pressed simultaneously is as follows:

1. With inductor L2 not shorted, the maximum voltage across the 0.1 ohm resistor is 1.5 volt peak for 0.050 micro-second. The transient condition has dampened 1.5v peak to 0.1v peak in 1.2 micro-seconds.

2. With inductor L2 shorted, the maximum voltage across the 0.1 ohm resistor is 2.3 volt peak for 0.090 micro-second. The transient condition has dampened 2.3 peak to 0.1v peak in 1.2 micro-second.

Varying the voltage from 27.5 to 30.0 VDC has little effect on the magnitude and duration of the transient condition. There is 0.8 peak volt and 0.040 micro-second difference for L2 not shorted and L2 shorted. The duration of the transient did not change as indicated by the above conditions. Inductor L2 is required in order to minimize the magnitude and duration of the transient condition caused by lamp testing.

c. The wave shape across the DC input line, with input voltage from 27.5 to 30.0 VDC and 10 status indicators to 60 status indicators illuminated, varied very little in maximum voltage peak and duration of the transient condition, as indicated by Figure 3.3.8.1-6.

There was a large difference in the duration of the transient condition for Inductor L1 shorted and not shorted.

With L1 shorted, the duration of the transient was greated than 3 times L1 not shorted. This indicates that L1 is an important component of the DC Filter in order to dampen transients due to load fluctuations.

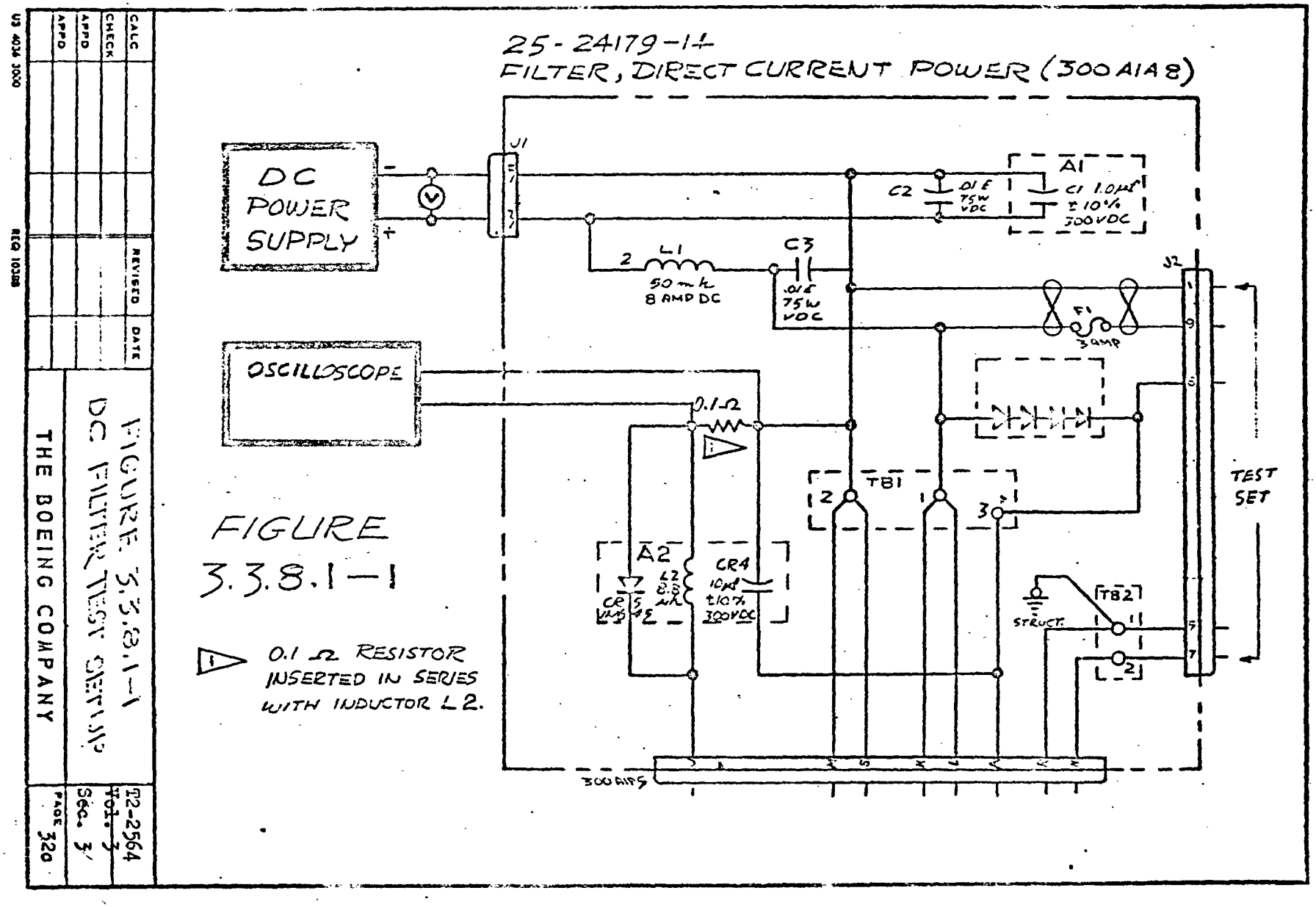
d. The data obtained for the DC Input Filter analysis of the Launch Control Console is seen in Figures 3.3.8.1-5 and -6.

GENERAL INFORMATION

Test Engineer T. G. McCarthy ORG. 2-6524-4

Charge to EWA Number 3007
Date Test Started 6-18-62
Date Test Completed 6-22-62
Location 9.120 Bldg; Bay E-9; DC Plant

57


25-24179-14
FILTER, DIRECT CURRENT POWER (300 A1A 8)
DC POWER SUPPLY
OSCILLOSCOPE
J1
J2
L1
50 mh
8 AMP DC
C2
.01 µF
75W
VDC
A1
C1 1.0 µF
± 10%
300 VDC
C3
.01 µF
75W
VDC
F1
3 AMP
0.1 Ω
TB1
TB2
A2
CR4
10 µF
±10%
300 VDC
STRUCT
TEST SET
300 AMPS
FIGURE
3.3.8.1-1
0.1 Ω RESISTOR INSERTED IN SERIES WITH INDUCTOR L2.
FIGURE 3.3.8.1-1
DC FILTER TEST SETUP
THE BOEING COMPANY
CALC
CHECK
APPD
APPD
REVISED
DATE
D2-2564
Vol. 3
Sec. 3
PAGE 320

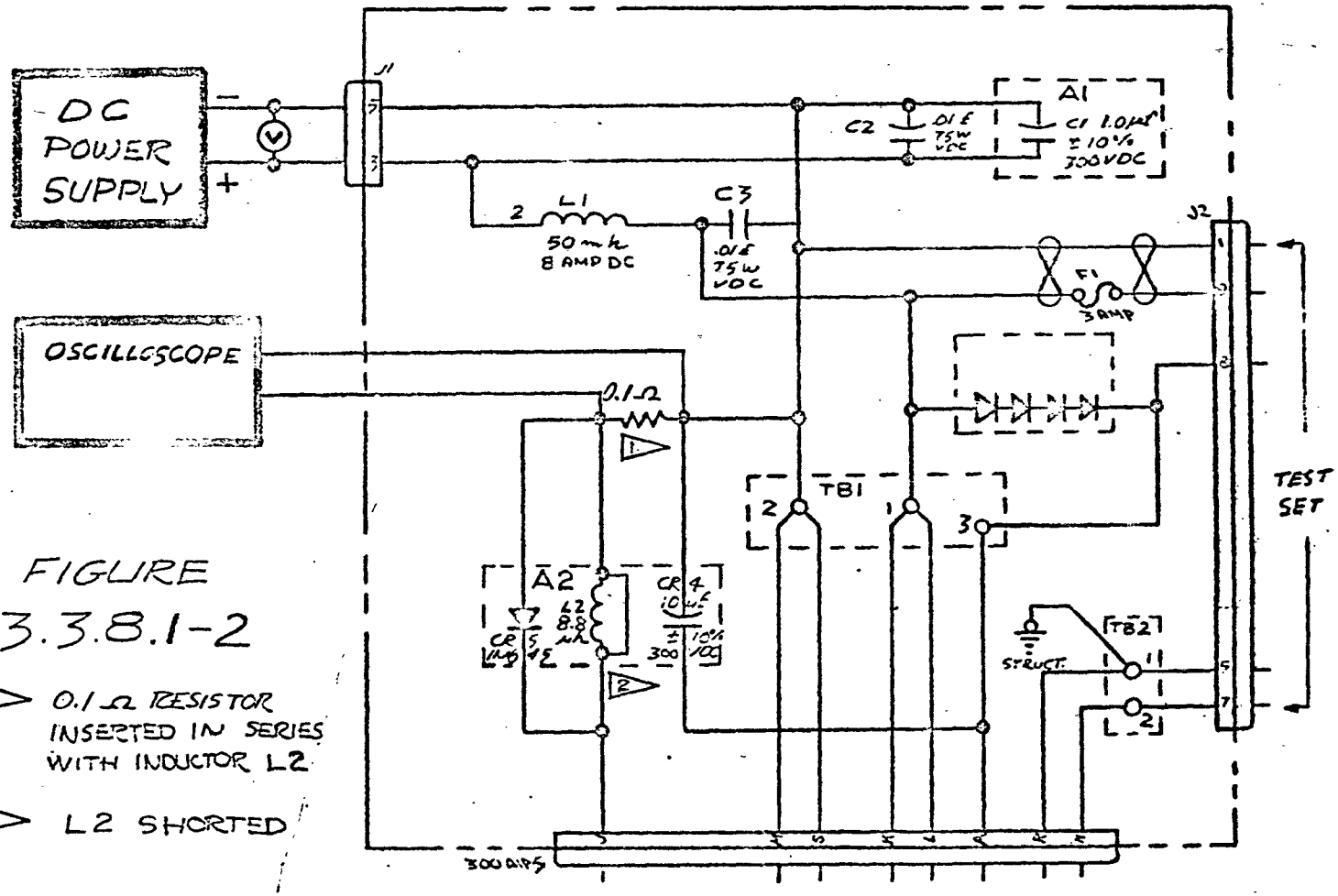


FIGURE 3.3.8.1-2
DC FILTER TEST SETUP

1 ▽ 0.1 Ω RESISTOR INSERTED IN SERIES WITH INDUCTOR L2

2 ▽ L2 SHORTED

				CALC	
				CHECK	
				APPD	
				APPD	
				REVISED	
				DATE	

THE BOEING COMPANY

D2-2564
Vol. 3
Sec. 3
PAGE 32d

BOEING 3000
REQ 10388

C7

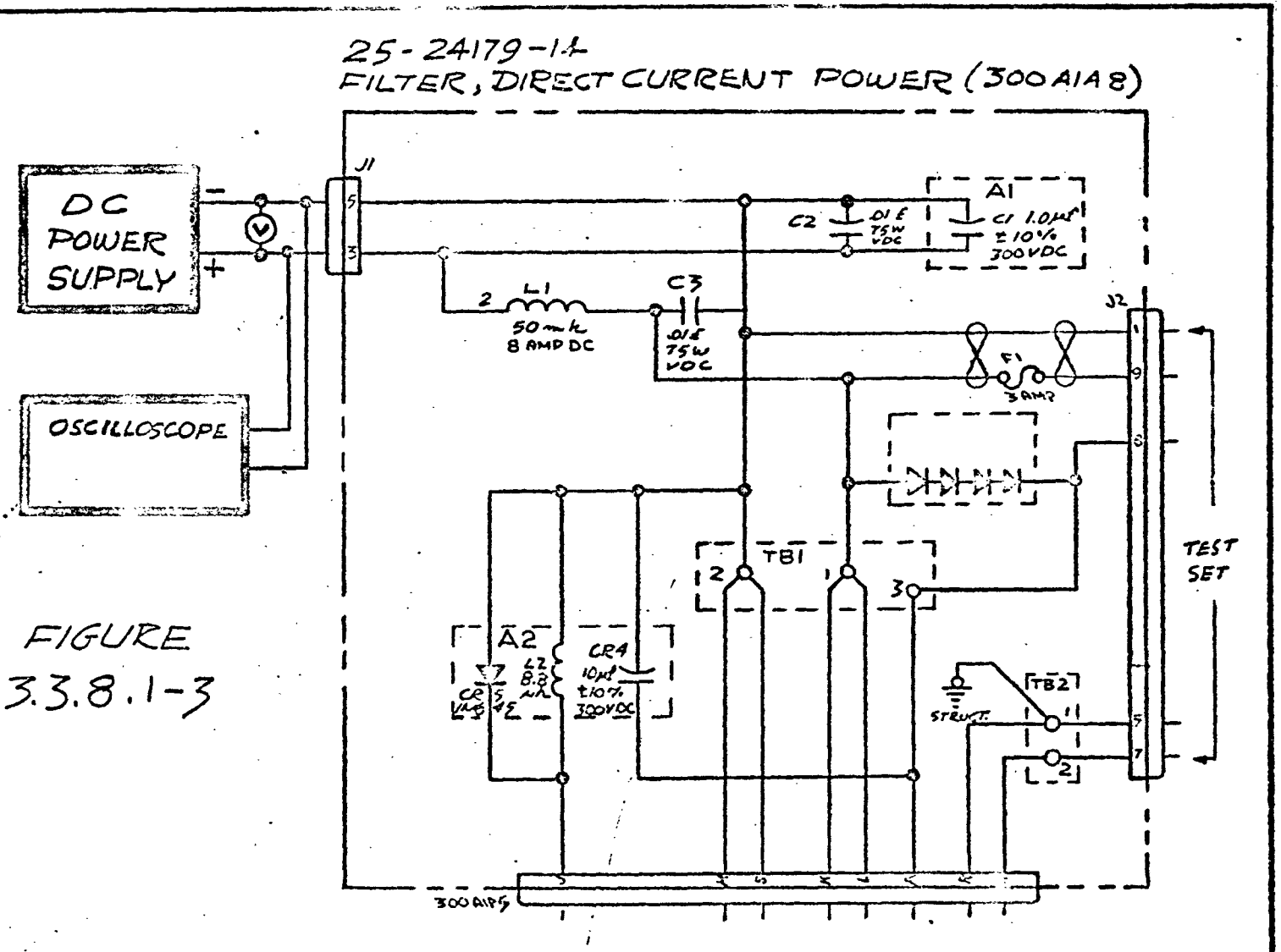


FIGURE
3.3.8.1-3

					CALC		
					CHECK		
					APPD		
					APPD		
					REVISED		
					DATE		

US 4034 3000 REQ 10088

THE BOEING COMPANY

FIGURE 3.3.8.1-3
DC FILTER TEST SETUP

D2-2564
Vol. 3
Sec. 3
PAGE 320

87

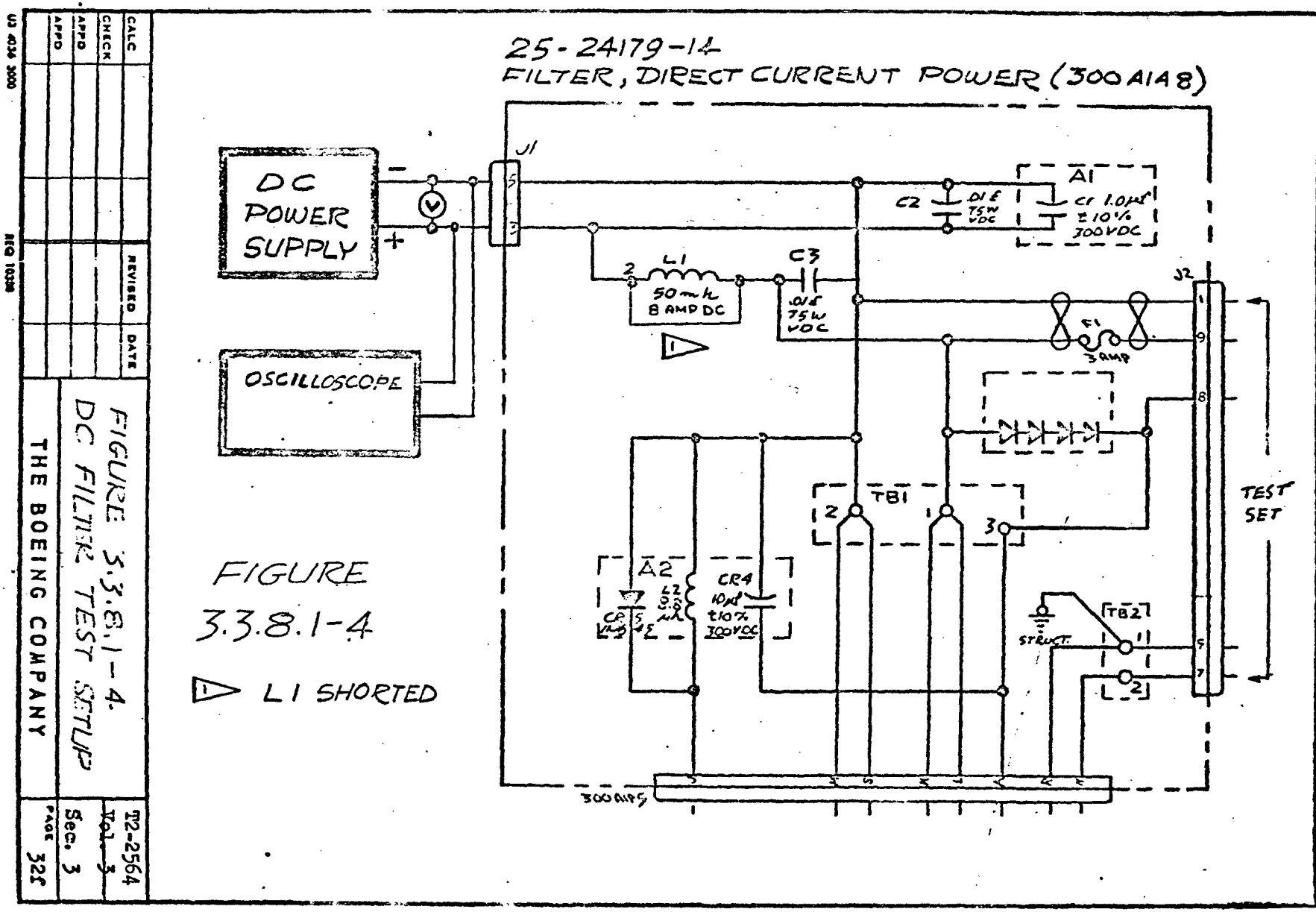


FIGURE 3.3.8.1-4.
DC FILTER TEST SETUP

FIGURE
3.3.8.1-4

△ L1 SHORTED

THE BOEING COMPANY

D2-2564
Vol. 3
Sec. 3
PAGE 325

CALC
CHECK
APPD
APPD
REVISED
DATE

DC INPUT FILTER

	INPUT VOLTAGE	MAX. VOLTAGE (PEAK) ACROSS 0.1 OHM	DURATION OF MAX. VOLTAGE (PEAK) IN MICRO-SECONDS	DURATION OF TRANSIENT CONDITION IN MICRO-SECONDS
ONE LAUNCHER AND LAMP TEST PRESSED SIMULTANEOUSLY. L2 NOT SHORTED	27.5	1.0	0.025	0.7
	28.0	0.8	0.038	0.8
	28.5	1.0	0.030	0.8
	29.0	1.0	0.025	0.8
	29.5	0.75	0.025	0.8
	30.0	1.0	0.030	0.8
TWO LAUNCHERS AND LAMP TEST PRESSED SIMULTANEOUSLY L2 NOT SHORTED.	27.5	1.2	0.045	0.8
	280	1.2	0.050	0.9
	28.5	1.4	0.050	1.0
	29.0	1.5	0.050	1.1
	29.5	1.5	0.050	1.1
	30.0	1.5	0.050	1.2
ONE LAUNCHER AND LAMP TEST PRESSED SIMULTANEOUSLY. L2 SHORTED	27.5	2.0	0.075	1.1
	28.0	2.0	0.075	1.1
	28.5	2.1	0.075	1.1
	29.0	2.2	0.080	1.2
	29.5	2.2	0.080	1.2
	30.0	2.2	0.080	1.2
TWO LAUNCHERS AND LAMP TEST PRESSED SIMULTANEOUSLY L2 SHORTED	27.5	2.0	0.080	1.2
	28.0	2.2	0.090	1.2
	28.5	2.3	0.090	1.2
	29.0	2.2	0.090	1.1
	29.5	2.3	0.090	1.2
	30.0	2.2	0.100	1.2.

CALC			REVISED	DATE
CHECK				
APPD				
APPD				

FIGURE 3.3.8.1-5
DC FILTER DATA

THE BOEING COMPANY

T2-2564
~~Vol. 3~~
Sec. 3
PAGE 32g

U3 4036 3000 REQ 10388

DC INPUT FILTER

		NUMBER OF INDICATORS ILLUMINATED	MAXIMUM VOLTAGE (PEAK)	DURATION OF TRANSIENT CONDITION IN MICRO-SECONDS
27.5 VDC	LI NOT SHORTED	10	1.1	1.8
		30	1.0	1.8
		60	1.0	1.8
	LI SHORTED	10	1.2	>5.5
		30	1.2	>5.5
		60	1.2	>5.5
28.0 VDC	LI NOT SHORTED	10	1.0	1.8
		30	1.0	1.8
		60	1.0	1.8
	LI SHORTED	10	1.0	>5.5
		30	1.2	>5.5
		60	1.1	>5.5
30.0 VDC	LI NOT SHORTED	10	1.1	1.8
		30	1.1	1.8
		60	1.0	1.8
	LI SHORTED	10	1.0	>5.5
		30	1.2	>5.5
		60	1.0	>5.5

			REVISED	DATE
CALC				
CHECK				
APPD				
APPD				

FIGURE 3.38.1-6
DC FILTER DATA

THE BOEING COMPANY

T2-2564
~~Vol. 3~~
Sec. 3
PAGE 32h

U3 4036 3000 REQ 10388

TEST REPORT 3.3.8.2

TITLE

Worst Case DC Input Filter Test

OBJECTIVE

To determine the effect of the maximum DC in-rush for the Launch Control Console at Worst Case operating conditions.

CONCLUSIONS

a. The test objective was realized

b. The filtering circuits of the Launch Control Console met the requirements of the Model Specification D2-5450.

c. The results of the test are directly applicable to the EC-1 Launch Control Console, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 535A with camera

DC Power Supply, Invar TP-15

Adapter, DC Power

TEST DESCRIPTION

a. Observe the wave shape across the DC input line with an input voltage of 30 VDC and simultaneous illumination of sixty status indicators and both audible alarms.

b. Test set-up is seen on Figure 3.3.8.2-1.

SUMMARY OF TEST RESULTS

The wave shape across the DC input filter, with an input voltage of 30 volts DC, 60 indicators illuminated, and both audible alarms activated, had a maximum voltage peak of 1.7 volts for 0.04 micro-second duration. The total transient duration lasted 1.8 micro-seconds. The DC filter proved it would minimize transients under worst case conditions.

GENERAL INFORMATION

Test Engineer	T. G. Mc Carthy	Org 2-6524-4
Charge to EWA	3007	
Date Test Started	6-25-62	
Date Test Completed	6-27-62	
Location	9.120; Bay E9; DC	

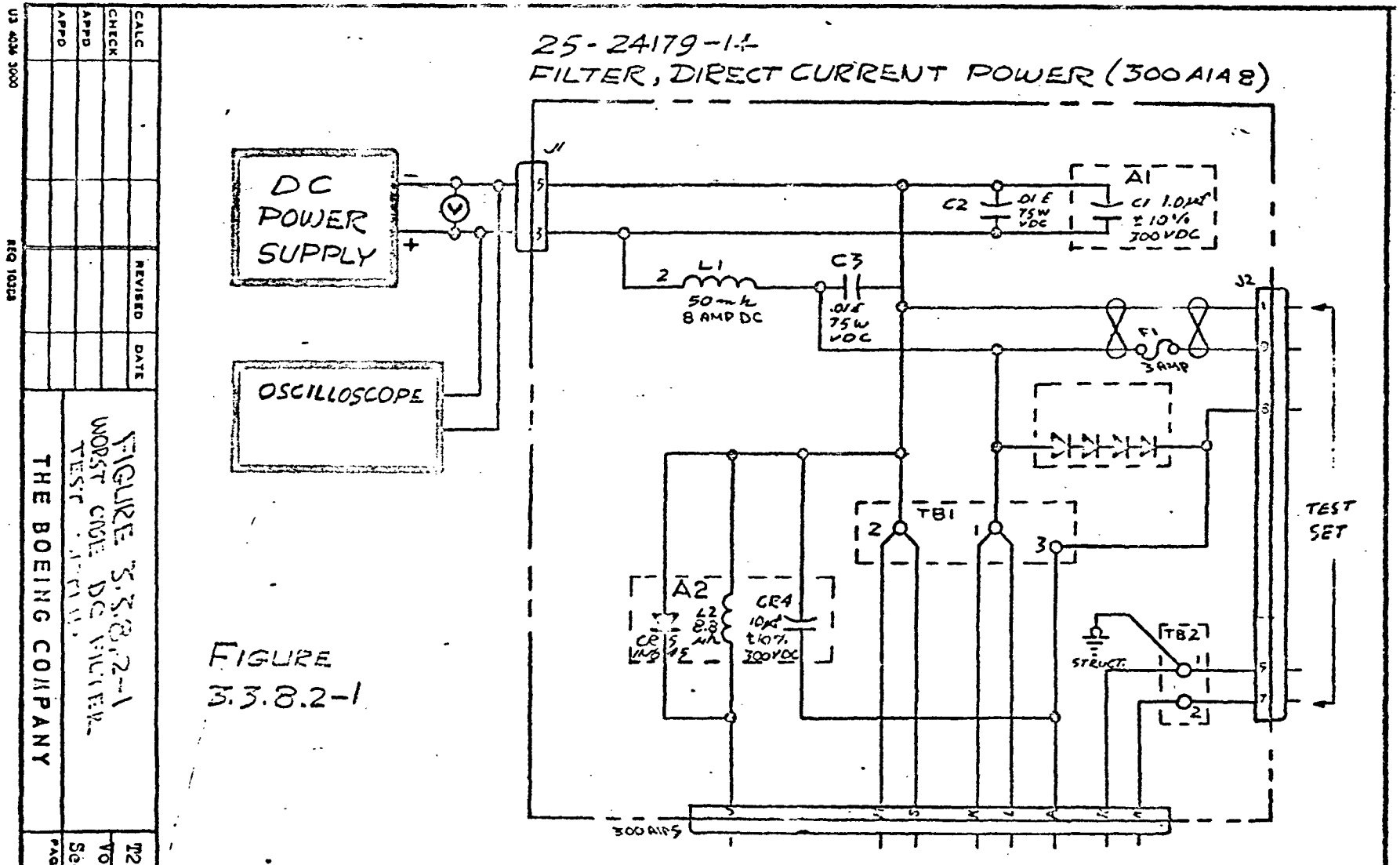


FIGURE 3.3.8.2-1

FIGURE 3.3.8.2-1 WORST CASE DC FILTER TEST CIRCUIT

	CALC	CHECK	APPD	REVISED	DATE

US 4036 3000 REQ 10358

THE BOEING COMPANY

D2-2564
Vol. 3
Sec. 3
PAGE 33b

TEST REPORT 3.3.8.3

TITLE

Off Design Input Filter Test

OBJECTIVE

To determine the current drain at which the DC input filter becomes ineffective.

CONCLUSIONS

a. Test objective was not realized. The DC Filter of the Launch Control Console does not reach a point, under maximum operating conditions for the console, where it becomes ineffective.

b. The results of the test are directly applicable to the BC-1 LCC since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 545 with camera

DC Voltmeter, Simpson 260A

Adapter, DC Power

TEST DESCRIPTION

a. Wave shape across the DC input line with an input voltage variation from 24 to 34 in 1 volt steps and simultaneous activation of status indicators, starting at 60 and increasing until Filter saturates.

b. Test set-up is seen on Figure 3.3.8.3-1

SUMMARY OF TEST RESULTS

Under maximum operating conditions, the DC Filter of the Launch Control Console does not reach a point, where it becomes ineffective. With an input voltage of 34 VDC, 100 indicators illuminated, and both alarms activated, the maximum voltage peak was 2.4 volts for less than 0.1 micro second. With 24 VDC, 100 indicators illuminated, and both alarms actived, the maximum voltage peak was 2.0v for less than 0.1 micro second. This proves that the DC Filter will operates efficiently under all on-design conditions.

TEST REPORT 3.3.8.3 (continued)

GENERAL INFORMATION

Test Engineers T. G. Mc Carthy Organization 2-6524-4

M. D. Novak 2-6524-4

Charge to EWA 3007

Date Test Started 7-27-62

Date Test Completed 7-29-62

Location 9.120 Building; Bay E-9; DC Plant

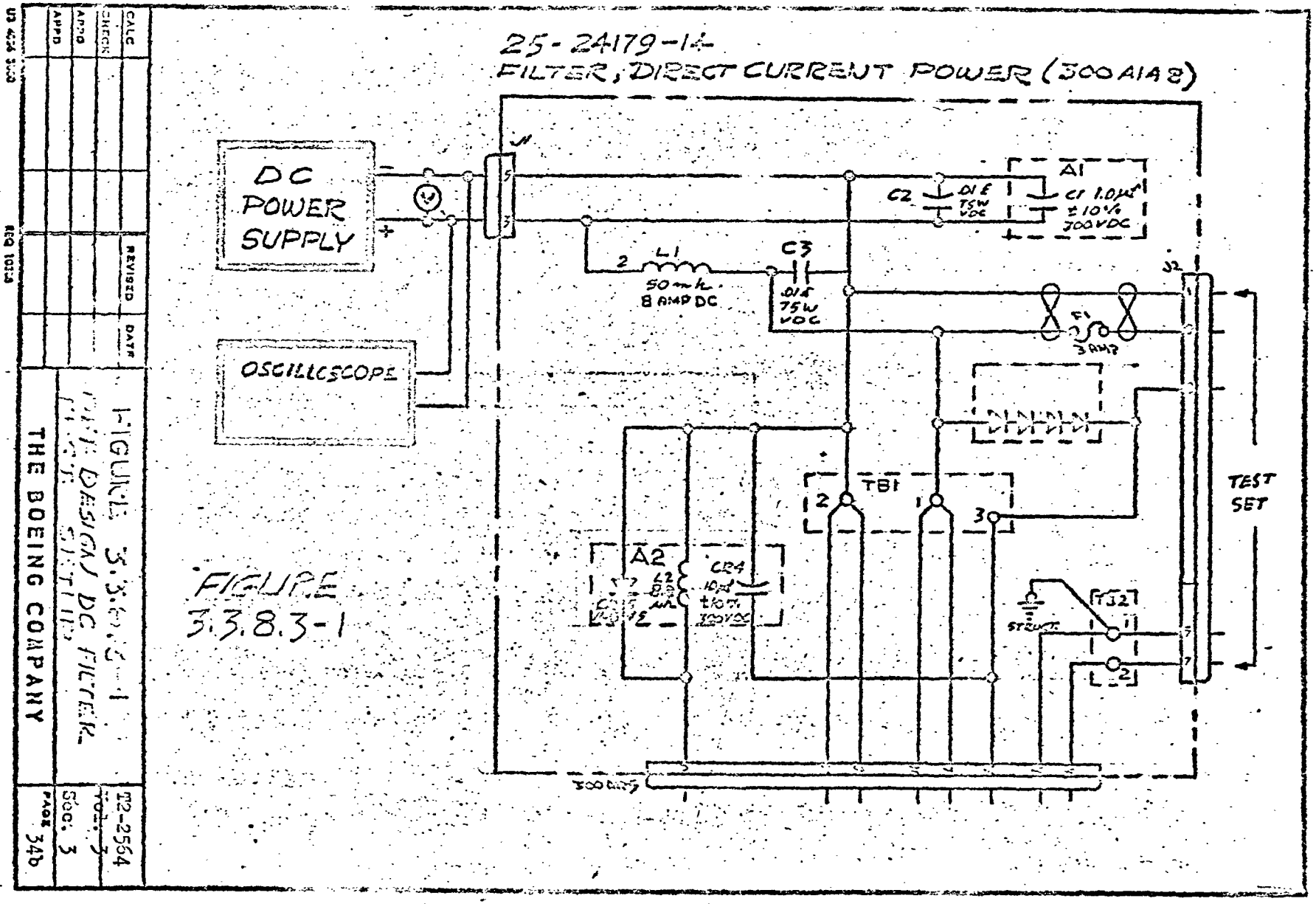


FIGURE 3.3.8.3-1

THE BOEING COMPANY

FIGURE 3.3.8.3-1
FILTER, DIRECT CURRENT POWER

D2-2564
REV. J
SEC. 3
PAGE 34b

TEST REPORT 3.3.8.4

TITLE

Launch Control Console AC Input Filter Test

OBJECTIVE

To determine the effectiveness of the AC Line Filter under normal operating conditions.

CONCLUSIONS

a. The test objective was realized.

b. The AC Filter Circuit of the Launch Control Console met the requirements of the Model Specification.

c. The results of the test are directly applicable to the BC-1 LCC, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Serial No. 0002, 25-24172-7.

Oscilloscope, Tektronix 545 with camera

AC Voltmeter, ± 1 per cent, 150 V full scale.

Variac

DC Power Supply, Invar TP-15

Adapter - DC Power

Adapter - AC Power

TEST DESCRIPTION

a. Oscilloscope readings of interference present on AC Input Line due to bell activiation with an AC input voltage from 108 to 132 VAC at 2 volt intervals with the input frequency at 60 cps.

b. Repeat (a) above for buzzer.

c. Repeat (a) above for both bell and buzzer.

d. Repeat (a) through (c) above for alarm deactivation.

e. Test set-up for (a) through (d) is seen on Figure 3.3.8.4-1

SUMMARY OF TEST RESULTS (continued)

of the bell and/or buzzer for 132 volts at 62 cycles per second. This indicates the AC Filter is operating properly under worst case voltage conditions.

GENERAL INFORMATION

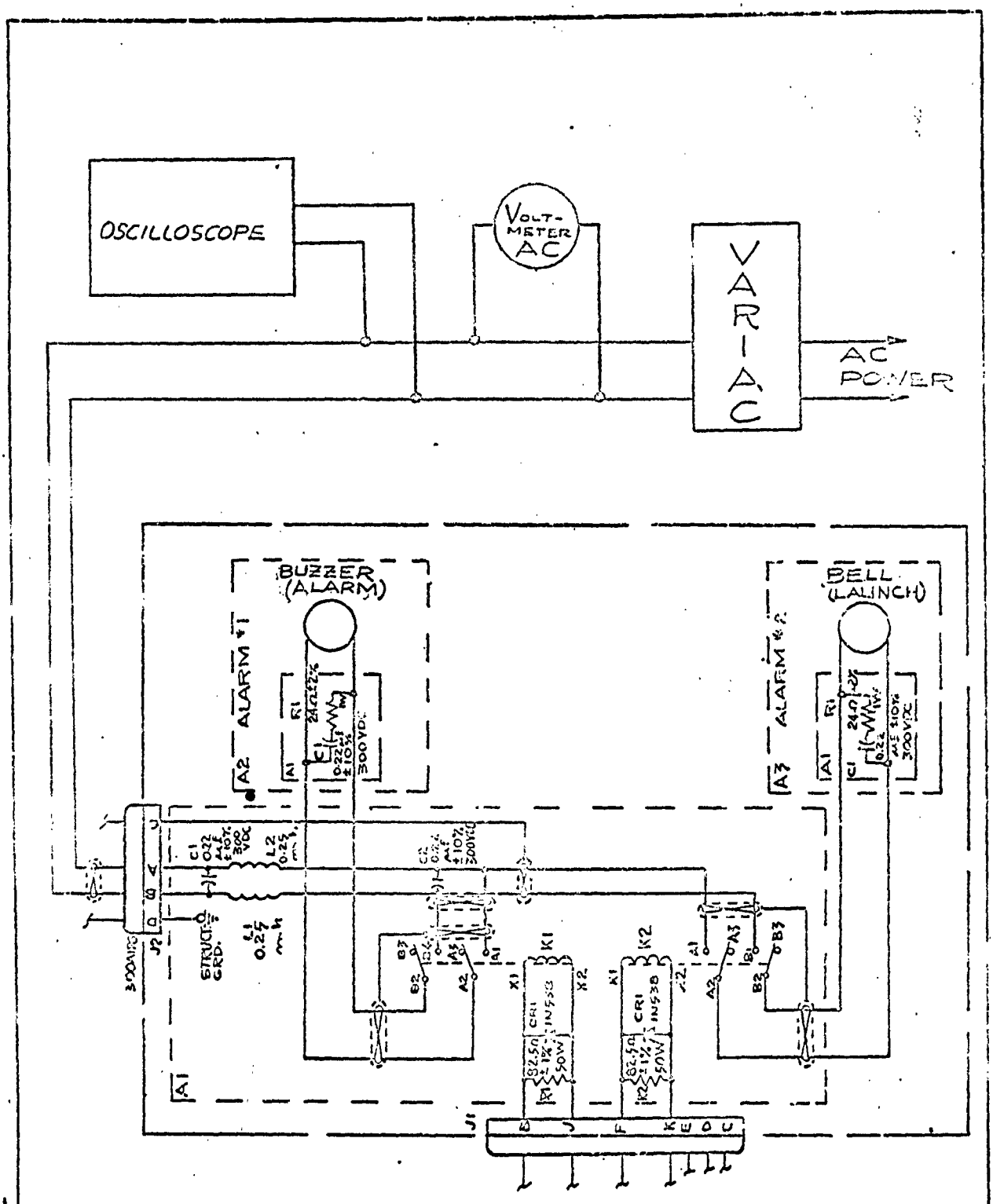
Test Engineer T. G. McCarthy Org. 2-6524-4

Charge to E7A Number 3007

Date Test Started 7-1-2

Date Test Completed 7-1-2

Location 9.120 Building; Bay E-9 ; Plant DC



CALC				REVISED	DATE	FIGURE 3.3.8.4-1 AC FILTER TEST SETUP
CHECK						
APPD						
APPD						

	D2-2564
	Vol. 3
	Sec. 3
DOEING AIRPLANE COMPANY	PAGE 35b

TEST REPORT 3.3.8.5

TITLE

Worst Case AC Input Filter Test

OBJECTIVE

To determine the effectiveness of the AC Line Filter under worst case operating conditions.

CONCLUSIONS

a. The test objective was realized.

b. The AC Filter Circuit met the requirements of the Model Specification, D2-5450 and verified the design.

c. The results of the test are directly applicable to the EC-1 LCC since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure A 1243, Serial No. 0002, 25-24172-7

Oscilloscope, Tektronix 545 with camera

AC Voltmeter, ± 1 per cent, 150 V full scale

Power Amplifier, McIntosh MI-200

Signal Generator, Precision E-310

Frequency Meter, Hewlett - Packard 521C

TEST DESCRIPTION

a. Oscilloscope pictures of interference present on AC input line due to bell activation with an input of 132 VAC at 62 cps.

b. Repeat (a) above for buzzer.

c. Repeat (a) above for both bell and buzzer.

d. Repeat (a) through (c) above for alarm deactivation.

e. Test set-up for (a) through (d) is seen on Figure 3.3.8.5-1.

SUMMARY OF TEST RESULTS

Negligible interference is reflected into the AC line due to activation of the bell and/or buzzer for voltage variables of 108 to 132 VAC at 60 cycles per second. This indicates the AC Filter is operating properly under operational conditions.

GENERAL INFORMATION

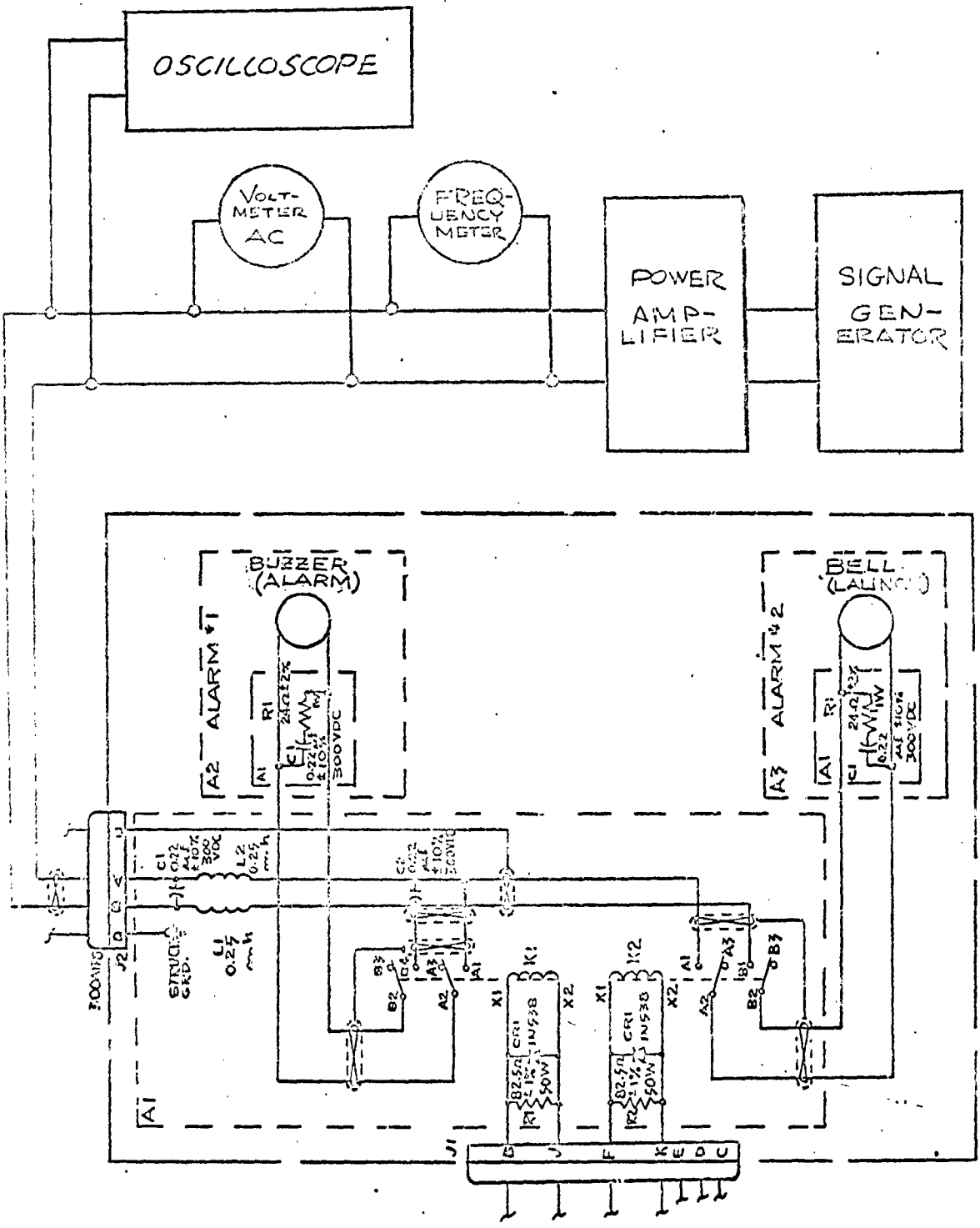
Test Engineer T. G. McC[illegible] Organization 2-6524-4

Charge to EWA Number 3007

Date Test Started 6-29-62

Date Test Completed 7-01-62

Location 9.120 Bldg; Bay E-9; DC Plant



			REVISED	DATE
CALC				
CHECK				
APPD				
APPD				

FIGURE 3.3.8.5.-1
WORST CASE
AC FILTER TEST SETUP

BOEING AIRPLANE COMPANY

T2-2564
Vol. 3
Sec. 3
PAGE 36b

TEST REPORT 3.3.9.1

TITLE

Launch Control Console Status Indicator Illumination Evaluation

OBJECTIVE

To determine the illumination properties of the status indicators under operating conditions

CONCLUSIONS:

(a) The test objective was realized.

(b) The illumination of the status indicators met the requirements of the Model Specification D2-5450 and verified the design.

(c) The results of this test are directly applicable to the BC-1 Launch Control Console, since there is no change in this portion of the circuit.

ITEMS IN TEST

Launch Control Console, Figure "A" 1243, Serial No. 0002, 25-24172-7

Illumination Meter, Weston 610

DC Voltmeter, Simpson 260

DC Power Supply, Invar TP-15

Adapter - DC Power

TEST DESCRIPTION

a. Light intensity was measured for each color of indicator with a DC input voltage from 27.5 to 30 VDC measured every 0.5 volts, and also with 0 volts with respect to power common applied to the status line.

b. Ambient light intensity upon display panel of the Launch Control Console was measured.

c. Distance at which each indicator color is just distinguishable was measured with a DC input voltage from 27.5 to 30 VDC in 0.5 volt steps, and also with 0 volts with respect to power common applied to the status line.

d. Effect of lamp test of one launch facility on illuminated indicators was recorded at 27.5 and 30 VDC, and also with 0 volts with respect to power common applied to the status line.

TEST DESCRIPTION (continued)

e. (d), above was repeated for simultaneous lamp test of two launch facilities.

SUMMARY OF TEST RESULTS

(a) Measurements of light intensity for each indicator color for varying input voltages are recorded in Table 3.3.9.1-1.

(b) The ambient light intensity was 93 foot candles directly on the face of the console under test.

(c) The ambient light intensity was 24 foot candles directly on the face of the console under operating conditions at STP III

(d) The lights can be distinguished at 50 feet from the console with either 24 or 93 foot candles ambient light, and the input voltage varied from 27.5 to 30.0 VDC.

(e) The effects of lamp test on illuminated indicators for 27.5 and 30 VDC are recorded in Tables 3.3.9.1-2 and 3.3.9.1-3.

(f) V[illegible]ion of light intensity of indicators with same color lens is attributed to candle power tolerance and the difference of "illuminated" time accumulated by the bulbs.

STATUS INDICATOR ILLUMINATION

1. Light Intensity for Each Color with DC Input of 27.5 to 30.0

		27.5 VDC	28.0 VDC	28.5 VDC	29.0 VDC	29.5 VDC	30.0 VDC
RED	Fault	2.86	3.10	3.40	3.64	3.94	4.26
	Warhead Alarm	3.30	3.60	4.00	4.24	2.64	4.98
	Outer Security Violated	3.06	3.46	3.76	3.96	4.20	4.48
	Inner Security Violated	1.80	1.90	2.06	2.24	2.40	2.70
GREEN	Strategic Alert	1.44	1.60	1.80	1.96	2.16	2.36
	Missile Away	2.10	2.30	2.56	2.78	3.00	2.56
WHITE	Stand-By	11.20	12.80	14.0	16.0	17.4	18.4
	Launch In Process	7.80	8.30	9.40	9.70	11.00	11.70
AMBER	Armed	10.60	11.80	13.0o	14.20	14.90	16.60
	Launch Commanded	9.30	12.20	10.90	11.90	12.70	13.50
RED	Code Dissipated	.48	.60	.64	.70	.76	.80

Figure 3.3.9.1-1

NOTE: (1) On order to cover a single indicator, it was necessary to use only 1 cell of the 2 cell light meter and the readings have been doubled before tabulation.

(2) When the light bulbs from Standby were put into Launch In Process the intensity of Launch In Process rose to those of Standby.

(3) All readings taken with status line at 0 volts.

(4) All readings measured in foot candles.

STATUS INDICATOR ILLUMINATION

		27.5 VDC	30.0 VDC
Red	Fault	3.70	5.40
	Warhead Alarm	3.66	5.00
	Outer Security Violated	2.6	3.60
	Inner Security Violated	2.2	3.04
Green	Strategic Alert	2.78	4.00
	Missile Away	2.60	3.80
White	Standby	15.20	23.00
	Launch In Process	11.50	18.00
Amber	Armed	12.90	19.40
	Launch Commanded	10.20	14.50

Figure 3.3.9.1-2

NOTE: (1) Figure 3.3.9.1-2 is data for Lamp Test Pushed and 1 Lamp Group On.

(2) All readings in foot candles.

STATUS INDICATOR ILLUMINATION

		27.5 VDC	30.0 VDC
Red	Fault	3.66	5.30
	Warhead Alarm	3.60	4.80
	Outer Security Violated	2.30	3.20
	Inner Security Violated	2.00	2.80
Green	Strategic Alert	2.32	3.60
	Missile Away	2.32	3.40
White	Standby	14.80	22.40
	Launch In Process	11.00	17.60
Amber	Armed	12.60	18.40
	Launch Commanded	9.90	14.30

Figure 3.3.9.1-3

NOTE: (1) Figure 3.3.9.1-3 is data for Lamp Test Pushed and 2 Lamp Groups On.

(2) All readings in foot candles.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-9-62

Date Test Completed 7-16-62

Location: Bldg 9-120; Bay E-9 ; Plant DC

TEST REPORT 3.3.9.2

TITLE:

Worst Case Launch Control Console Status Indicators Illumination Evaluation

OBJECTIVE:

To determine the illumination properties of the status indicators at worst case conditions.

CONCLUSIONS:

(a) The test objective was realized.

(b) The illumination of the status indicators under worst case conditions met the requirements of the Model Specification D2-5450 and verified the design.

(c) The results of this test are directly applicable to the BC-1 Launch Control Console, since there is no change in this portion of the circuit.

ITEMS IN TEST:

Launch Control Console, Figure "A" 1243 Serial No. 0002. 25-24172-7

Illumination Meter, Weston 610

DC Power Supply, Invar TP-15

Adapter - DC Power

TEST DESCRIPTION:

(a) Light intensity was measured for each indicator color with a DC input of 27.5 VDC and a status input of 4.0 VDC.

(b) The distance at which each indicator color is just distinguishable was measured with a DC input of 27.5 VDC, a status input of 4.0 VDC and an illumination of 65 foot candles on the surface of the display panel.

SUMMARY OF TEST RESULTS:

a. Measurements of light intensity for each indicator color with 27.5 VDC and a status voltage of 4.0 VDC are listed below.

SUMMARY OF TEST RESULTS (continued)

Color	Indicator	Illumination (Foot Candles)
RED	Fault	1.30
	Warhead Alarm	1.28
	Outer Security Violated	.94
	Inner Security Violated	.72
	Code Dissipated	.78
GREEN	Stragetic Alert	.78
	Missile Away	.80
WHITE	Standby	4.8
	Launch In Process	3.60
AMBER	Armed	4.20
	Launch Commanded	3.60

b. The distance at which each indicator is visible with an input of 27.5 VDC, a status input of 4.0 VDC, and an illumination of 65 foot candles on the surface is 50 feet.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 7-9-62

Date Test Completed 7-16-62

Location: Bldg 9-120 ; Bay E-9 ; Plant DC

TEST REPORT 3.3.9.3

TITLE

Off Design Launch Control Console Status Indicator Illumination Test

OBJECTIVE

To determine the limit to which the "ON" status signal can deteriorate and still result in an acceptable status illumination.

CONCLUSIONS

(a) The test objective was realized.

(b) The results of this test are directly applicable to the BC-1 Launch Control Console, since there is no change in this portion of the circuit.

ITEMS IN TEST:

Launch Control Console, Figure "A" 1243, Serial No. 0002, 25-24172-7

Illumination Meter, Weston 610

DC Voltmeter, Simpson 260

DC Power Supply, Invar TP-15

Adapter, DC Power

TEST DESCRIPTION

Light intensity was measured for each indicator color with a DC input voltage from 24 to 34 volts in 1 volt steps and an "ON" status voltage input from 0 volts increasing in one volt steps until the illumination is unacceptable.

SUMMARY OF TEST RESULTS

(a) Light intensity for each indicator color is listed in Figure 3.3.9.3-1 with unacceptable intensities in the final column

(b) The intensity of each indicator for input voltages from 24 to 34 VDC in one volt steps is listed in Figure 3.3.9.3-2.

SUMMARY OF TEST RESULTS (continued)

		26 VDC	25 VDC	24 VDC	23 VDC	22 VDC	21 VDC	20 VDC	19 VDC	Unacceptable Column 18 VDC
RED	Fault	2.08	1.72	1.54	1.36	1.10	.90	.76	.60	.50
	Warhead Alarm	2.06	1.74	1.64	1.40	1.18	.98	.80	.66	.52
	Outer Security Violated	1.50	1.24	1.02	.86	.74	.60	.50	.40	.32
	Inner Security Violated	1.20	1.00	.90	.78	.64	.54	.44	.36	.30
GREEN	Strategic Alert	1.40	1.12	.96	.80	.64	.52	.40	.34	.24
	Missile Away	1.40	1.16	.92	.76	.60	.46	.40	.34	.24
WHITE	Standby	9.00	7.50	5.84	4.66	3.84	3.10	2.60	2.00	1.56
	Launch In Process	6.50	5.30	4.66	3.78	3.04	2.50	2.00	1.60	1.20
AMBER	Armed	7.40	5.64	5.04	4.16	3.40	2.74	2.20	1.72	1.30
	Launch Commanded	7.00	5.00	4.10	3.44	2.82	2.22	1.86	1.44	1.16
[illegible]ED	Code Dissipated	.36	.30	.20	.18	.16	.14	.14	.12	.10

Figure 3.3.9.3-1

NOTE: All figures are in foot candles except voltages as marked

SUMMARY OF TEST RESULTS (continued)

		24 VDC	25 VDC	26VDC	27VDC	28VDC	29 VDC	30 VDC	31VDC	32VDC	33VDC	34VDC
RED	Fault	1.44	1.72	2.08	2.60	3.10	3.64	4.26	5.00	5.70	6.30	7.00
	Warhead Alarm	1.46	1.74	2.06	2.56	3.60	4.24	4.98	4.50	5.00	5.60	6.40
	Outer Security Violated	1.06	1.24	1.50	1.80	3.46	3.96	4.48	2.90	3.24	3.64	4.06
	Inner Security Violated	.82	1.00	1.20	1.38	1.90	2.24	2.70	2.46	2.80	3.10	2.60
GREEN	Strategic Alert	.90	1.12	1.40	1.68	1.60	1.96	2.36	3.56	4.00	4.52	5.14
	Missile Away	.98	1.16	1.40	1.72	2.30	2.78	3.56	3.16	3.60	4.08	4.74
WHITE	Standby	5.70	7.50	9.00	11.00	12.80	16.0	18.40	19.0	21.60	24.40	28.00
	Launch In Process	3.66	5.30	6.50	7.60	8.30	9.70	11.70	14.60	16.40	18.60	22.40
AMBER	Armed	4.54	5.64	7.40	9.30	11.80	14.20	16.60	16.00	18.20	20.60	23.20
	Launch Commanded	3.90	5.00	7.00	8.60	10.20	11.90	13.50	12.00	14.00	16.40	18.40
RED	Code Dissipated	.26	.30	.36	.48	.64	.70	.80	.80	.94	1.10	.20

Figure 3.3.9.3-2

NOTE: (1) Readings are in foot candles.

(2) The 28, 29 and 30v readings were taken using the BC-1 Configurations legends, the others were Pre-BC-1.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge To EWA No. 3007

Date Test Started 7-23-62

Date Test Completed 7-26-62

Location: Bldg. 9-120; Bay E-9; Plant DC

TEST REPORT 3.3.10.1

TITLE

Telephone Transmitter Control Evaluation

OBJECTIVE

To evaluate the Telephone Transmitter Control of the Launch Control Console under operating conditions.

CONCLUSIONS

a. The test objective was realized.

b. The operation of the Telephone Transmitter Control met the requirements of the Model Specification D2-5450.

ITEMS IN TEST

Telephone Transmitter Control, Part No. 1274013-503, Serial No. 0000008, Part of Figure "A" 1243 Launch Control Console.

Oscilloscope, Tektronix 545

Sound Level Meter, General Radio 1551A

DC Power Supply, Trygon M35-5

Adapter - Telephone Transmitter Control

Handset, Figure "A" 1300

TEST DESCRIPTION

a. Sound level of the Telephone Transmitter Control Alarm, 500 cps tone chopped at 20 cps, was measured for input voltage variation from 27.5 to 30 VDC at 0.5 volt intervals. The Sound level measuring instrument was located 1 foot above the front center edge of the writing surface.

b. Distance at which the alarm is discernible was measured with the Launch Control Console Bell and Buzzer activated and also with a noise ambient of 74 db.

c. Effectiveness of flashing call lights was noted.

SUMMARY OF TEST RESULTS

a. Sound level of the chopped signal for varying input voltage is shown below:

SUMMARY OF TEST RESULTS (continued)

Input Voltage	Telephone Transmitter Control Alarm Output Chopped signal (decibels)
27.5	82
28.0	84
28.5	84
29.0	84
29.5	84
30.0	84
30.5	85

Ambient noise was 72 db.

b. The Telephone Transmitter Control alarm is discernible at a distance of 35 feet with the Launch Control Console bell and buzzer activated and with a noise ambient of 72 db.

c. Detecting and replacing burned out switch button-indicating light bulbs was done with ease.

d. The flashing call lights on the Telephone Transmitter Control are effective in determining an incoming call line, once the operator's attention is obtained by the Telephone Transmitter Control Alarm. Flashes are approximately one per second with time on equal to time off.

GENERAL INFORMATION

Test Engineer M. E. Novak Organization 2-6524-4

Charge to EWA No. 3007

Date Test Started 8-1-62

Date Test Completed 8-8-62

Location: Bldg, 9-120; Bay E-9; Plant DC

THE BOEING COMPANY

NUMBER T2-2564, Vol. 3 MODEL NO. VS-137A

TITLE Engineering Development Laboratory Test Reports,
Communications Control Console

PREPARED BY	T. G. McCarthy	7/18/62
SUPERVISED BY		7/18/62
APPROVED BY	P. K. Hagiwara	7/18/62
RELIABILITY APPROVAL		(DATE)

AF 04(647)-289
CONTRACT NO.

5-78105-5640-58619
CHARGE NUMBER

VOL. —
SEC. —

NO. T2-2564
PAGE 1 OF 22

2-5142

SECTION TITLE PAGE U3 4288 0000 REV. 2/61

<18>

SUMMARY

TO BE ADDED UPON COMPLETION OF TESTING.

This page will be a summary of the test results obtained during the EDI/PT program. It will be integrated results of all tests conducted during the program. The results will include meeting of design objectives, specifications, recommendations, etc.

TEST REPORT 4.3.1.1

TITLE

Physical Examination of the Communication Control Console, 25-27095-2

OBJECTIVE

To inspect the Communication Control Console for physical appearance, conformance to Engineering drawings and human engineering requirements.

CONCLUSIONS

The test objective was realized.

ITEMS IN TEST

Communication Control Console, Figure "A" 1338 , SN 0000001

Scale, 6 units 1/100th inch intervals

Scale, 12 units, 1/100th inch intervals

TEST DESCRIPTION

The components and subsystems of the Communication Control Console, OA-3460/GSW-4

a. Control, Communication System, C-3880/GSW-4	25-27723-2
b. Desk, Flat Top FN-130/GSW-4	BACC57B
c. Panel, Arming and Status SB-1517/GSW-4	25-31687-1
d. Panel, Phone, assembly	29-20924-1

The above were examined for:

1. General appearance and quality of workmanship
2. Conformance to MIL-STD-130A
3. Conformance to MIL-STD-803
4. Conformance to D2-10778
5. Conformance to applicable assembly drawings
6. Dimensions per drawing

SUMMARY OF TEST RESULTS

a. The Communication Control Console conformed to Engineering drawings. Measurements were within drawing tolerances.

SUMMARY OF TEST RESULTS (Continued)

b. The Model Specification D2-10778 states that all corners and edges exposed to contact by operating personnel shall have rounded contours. The front bottom corners of the writing desk have sharp edges which could be hazardous.

c. The physical appearance of the Communication Control Console could be improved if flush-mounting bolts were used on the outside of the desk BACC57B.

d. All other areas of the Communication Control Console were acceptable.

DESIGN IMPROVEMENT OR SIMPLIFICATIONS

a. Twenty per cent of the fasteners used to install the panels in the console were defective. The spring washer (BACF34D4R) used to retain the fasteners in place either broke or fell off prior to or during the panel removal. The fasteners (BACF34D4B6) are made of soft metal and is prone to chaffing, misalignment and in one case sheared completely. Metal filings, washers and fasteners falling into the console could cause shorts and serious damage to the equipment. More suitable fasteners could reduce the likelihood of damage to the console.

b. More time is required for the installation of both the Telephone Transmitter Control and the Arming and Status Panel than for removal due to the retainer chains on the connector dust covers catching between the panels and the console structure. Nicks and scratches on the equipment were attributed to this condition. Per Drawing No. 25-27095-2, Console, Communication Control, all connector dust caps are to be removed and discarded upon base installation except the dust cap on A2J3, which shall remain permanently affixed to the Arming and Status Panel. Therefore, the only chain which could cause problems after base installation is A2J3. Possible solutions to avoid this interference are:

1. Shortening the chain
2. Taping the chain out of the way before installation
3. Removing the chain before installation.

GENERAL INFORMATION

Test Engineer(s)	T. G. Mc Carthy	Org	2-6524-4
	M. E. Novak		2-6524-4
Charge to EWA Number	8848		
Date Test Started	6-26-62		
Date Test Completed	7-04-62		
Location	9-120 Bldg. Bay E9 DC		

TEST REPORT 4.3.2.1

TITLE

Maintainability of the Communications Control Console, 25-27095-2

OBJECTIVE

To inspect the Communications Control Console from a maintainability standpoint.

CONCLUSIONS

a. The test objective was realized.

b. The Communication Control Console met the requirements of the Model Specification D2-10778

ITEMS IN TEST

Communications Control Console Figure "A" 1338, SN 0000001

Scale, 0 to 150 lbs capacity
Scale, 0 to 1000 lbs capacity
Inserter - Extractor tools
Common hand tools

TEST DESCRIPTION

The Communications Control Console, its components and subsystems were examined from a maintainability standpoint

a. Communication Control Console	25-27095-2
b. Communication Control System	25-27723-3
c. Arming and Status Panel	25-31687-1
d. Filter Card	29-24322-1
e. Amplifier Card	25-31667-1
f. Speaker	BACL35A1
g. Telephone Transmitter Control	RCA 1274013-503

The above assemblies were examined for the following:

1. Evaluation of handling methods required for complete console and major subassemblies.

2. Ease of removal and/or access.

3. Weight

4. Number of personnel required for removal and/or replacement

TEST DESCRIPTION (Continued)

5. Time required for removal and/or replacement.

6. Skill level of personnel required for maintenance and handling.

7. Evaluation of techniques required for handling and/or storage.

8. Mating of connectors; possibility of damage due to misalignment or play.

9. Cable runs and placement; possibility of damage by chaffing or pinching during removal and/or replacement of modules and components.

10. Protrusions or sharp edges which may cause injury to personnel or damage to equipment during handling.

11. Procedures required by design to handle, remove and replace all modules, panels or components were recorded.

SUMMARY OF TEST RESULTS

a. The weights and time for removal and replacement of the major subassemblies are listed below:

Assembly	Time for Removal	Weight	Time for Replacement
Arming and Status Panel 25-31687-1	3 min.	24.0 #	4 min.
Telephone Transmitter Control RCA 1274013-503	5 min.	49.25	13 min.
Total Weight of Console	---	386.25	---

b. The number of personnel required for removal and/or replacement of the Telephone Transmitter Control is two; all other assemblies require one.

c. Twenty per cent of the fasteners used to install the panels in the console were defective. The spring washer (BACF34D4R) used to retain the fasteners in place either broke or fell off prior to or during the panel removal. The fasteners (BACF34D4B6) are made of soft metal and is prone to chaffing, misalignment and in one case sheared completely. Metal filings, washers and fasteners falling into the console could cause shorts and serious damage to the equipment. More suitable fasteners could reduce the likelihood of damage to the console.

d. More time is required for the installation of both the Telephone Transmitter Control and the Arming and Status Panel than for removal due to the retainer chains on the connector dust covers catching between the panels and the console structure. Nicks and scratches on the equipment were attributed to this condition. Per Drawing No. 25-27095-2, Console, Communication Control, all connector dust caps are to be removed and discarded upon base installation except the dust cap on A2J3, which shall remain permanently affixed to the Arming and Status Panel. Therefore, the only chain which could cause problems after base installation is A2J3. Possible solutions to avoid this interference are:

1. Shortening the chain
2. Taping the chain out of the way before installation
3. Removing the chain before installation.

SUMMARY OF TEST RESULTS (Continued)

e. A sharp protrusion was found on the back corner of the casting on the console frame (and front bottom corners of the writing desk) which could cause injury to personnel.

f. Bolts used to hold reinforcement frames are protruding. Flush-mounting bolts would improve this condition.

g. The desk drawers should have less play in the console and need structural improvement.

h. The cards and components of the Telephone Transmitter Control and the Status and Arming Panel were easily accessible and in good placement for maintenance.

i. Maintenance of this equipment requires a basic knowledge of electronics.

GENERAL INFORMATION

Test Engineer(s)	T. G. Mc Carthy	Org	2-6524-4
	M. E. Novak		2-6524-4
Charge to EWA Number	8848		
Date Test Started	6-26-62		
Date Test Completed	7-03-62		
Location	9-120 Bldg Bay E9 DC		

93

TEST REPORT 4.3.3.1

TITLE

Communications Control Console Acceptance Functional Test Procedure Evaluation, D2-11337, Vol. 1.

OBJECTIVE

To evaluate the Acceptance Functional Test Procedures for the Communication Control Console at the card level.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.3.2

TITLE

Communications Control Console Acceptance Functional Test Procedures Evaluation - D2-11337, Vol. 2

OBJECTIVE

To evaluate the Acceptance Functional Test Procedures for the Communications Control Console at the panel and module level.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

95

TEST REPORT 4.3.3.3

TITLE

Communications Control Console Acceptance Functional Test Procedures Evaluation - D2-11337, Vol. 3

OBJECTIVE

To evaluate the Acceptance Functional Test Procedures for the Communications Control Console at the Console level.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.4.1

TITLE

Maximum Temperature of Communications Control Console Components.

OBJECTIVE

To determine the maximum operating temperature of vital points in the Communications Control Console.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

Lb.

TEST REPORT 4.3.4.3

TITLE

Off Design Temperature Test of Communications Control Console Components.

OBJECTIVE

To determine the limits of the parameters affecting the temperature of Communications Control Console Components.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.5.1

TITLE

Communications Control Console DC Power Consumption

OBJECTIVE

To determine the DC power requirements of the Communications Control Console for various modes of operation.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

bb

TEST REPORT 4.3.5.2

TITLE

Worst Case Communications Control Console DC Power Consumption.

OBJECTIVE

To determine the maximum DC input power requirements of the Communications Control Console.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.6.1

TITLE

Communications Control Console Switch Evaluation.

OBJECTIVE

To determine the electrical and mechanical characteristics of the Status and Arming Panel Switches.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.7.1

TITLE

Amplifier Gain and Intelligibility Test.

OBJECTIVE

To determine the gain and intelligibility characteristics of the VRSA Amplifier in the Status and Arming Panel of the Communications Control Console.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.7.2

TITLE

Worst Case Amplifier Gain and Intelligibility Test.

OBJECTIVE

To determine the gain and intelligibility characteristics of the VRSA Amplifier in the Status and Arming Panel of the Communications Control Console under worst case conditions.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS.

TEST REPORT 4.3.7.3

TITLE

Off Design Amplifier Gain and Intelligibility Test

OBJECTIVE

To determine the limits of the parameters affecting the gain and intelligibility characteristics of the VRSA Amplifier.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

104

TEST REPORT 4.3.8.1

TITLE

Communications Control DC Input Filter Test

OBJECTIVE

To determine the DC in-rush for the Communications Control Console under various operating modes.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.8.2

TITLE

Worst Case DC Input Filter Test

OBJECTIVE

To determine the effect of the maximum DC in-rush for the Communications Control Console at worst case operating conditions.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.8.3

TITLE

Off Design DC Input Filter Test

OBJECTIVE

To determine the current drain at which the DC input filter becomes ineffective.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS

TEST REPORT 4.3.9.1

TITLE

Communications Control Console Insulation Test

OBJECTIVE

To determine the insulation resistance of the circuits of the Communications Control Console.

CONCLUSIONS

TO BE ADDED UPON COMPLETION OF TESTS